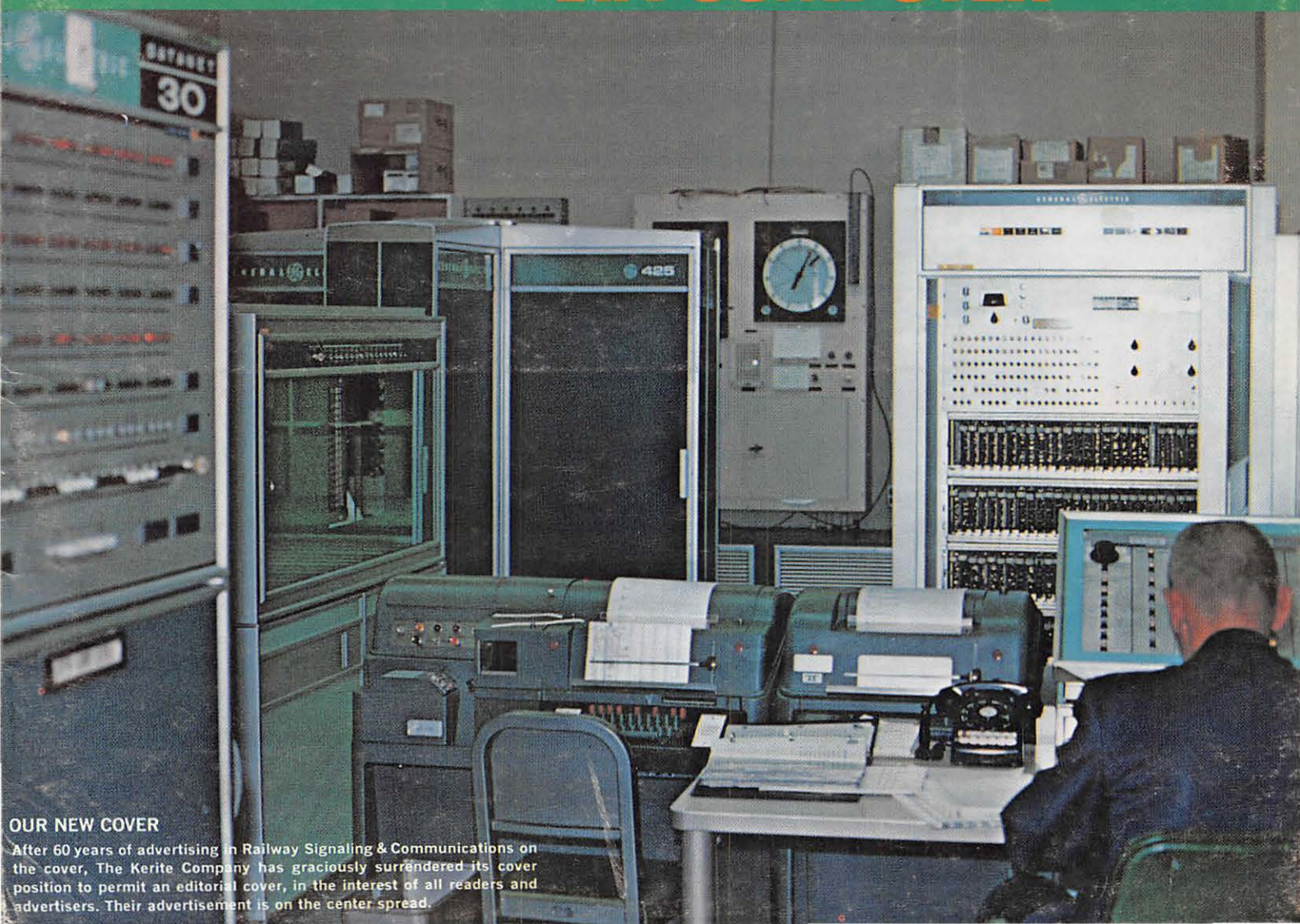
JANUARY 1970

rsc
RAILWAY SIGNALING AND COMMUNICATIONS

WESTERN PACIFIC GAINS CONTROL VIA COMPUTER



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After 60 years of advertising in Railway Signaling & Communications on the cover, The Kerite Company has graciously surrendered its cover position to permit an editorial cover, in the interest of all readers and advertisers. Their advertisement is on the center spread.

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devices for solid state circuitry . . . heavy duty surge

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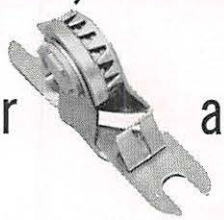
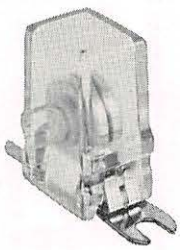
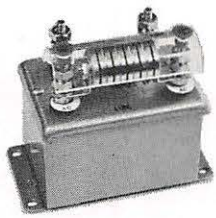
circuits to provide backup protection for  arresters . . .

 equalizers and  power line protectors!

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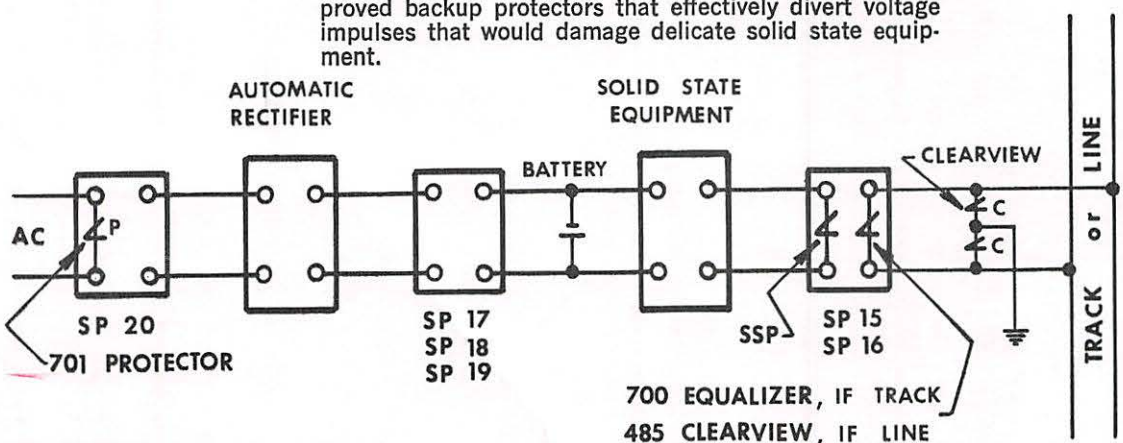

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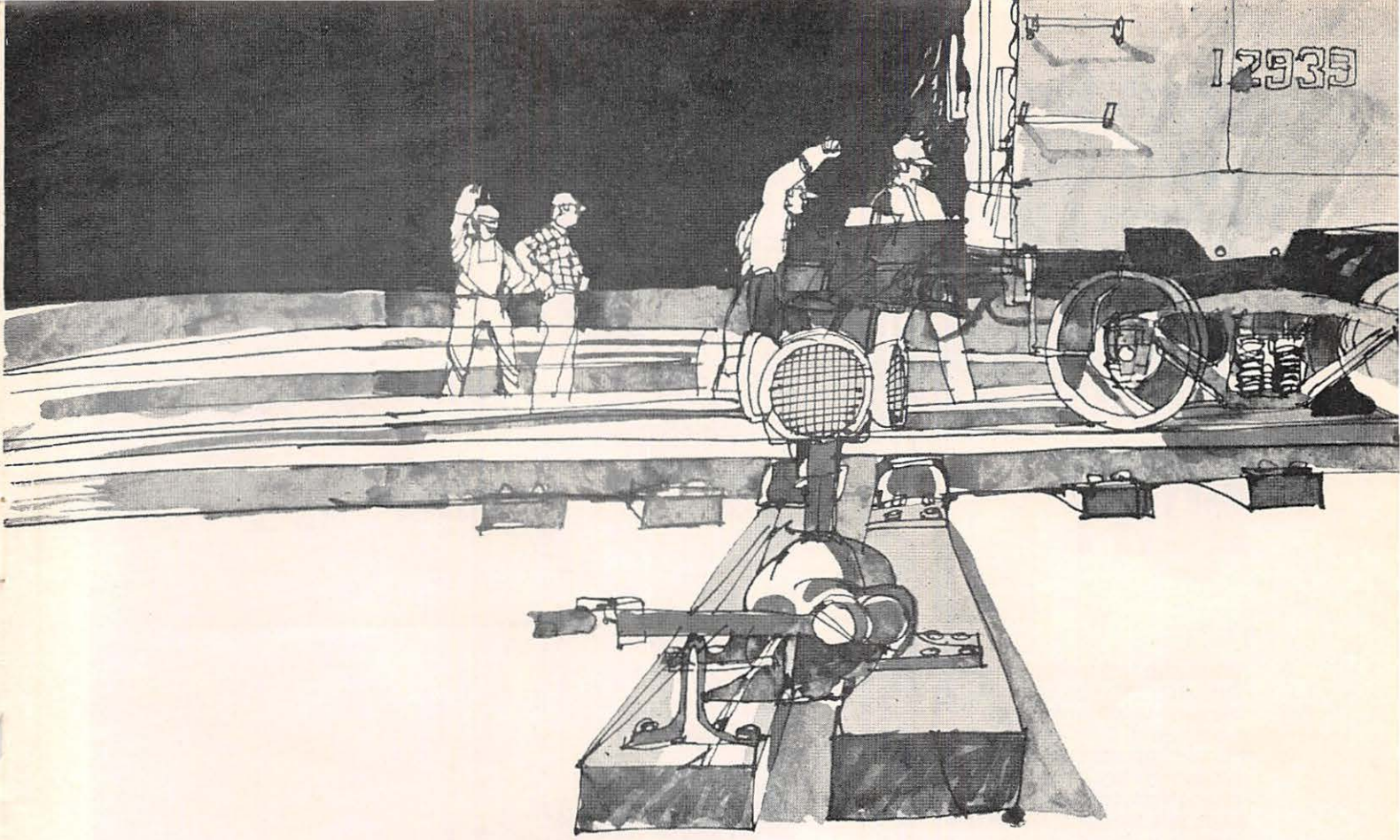

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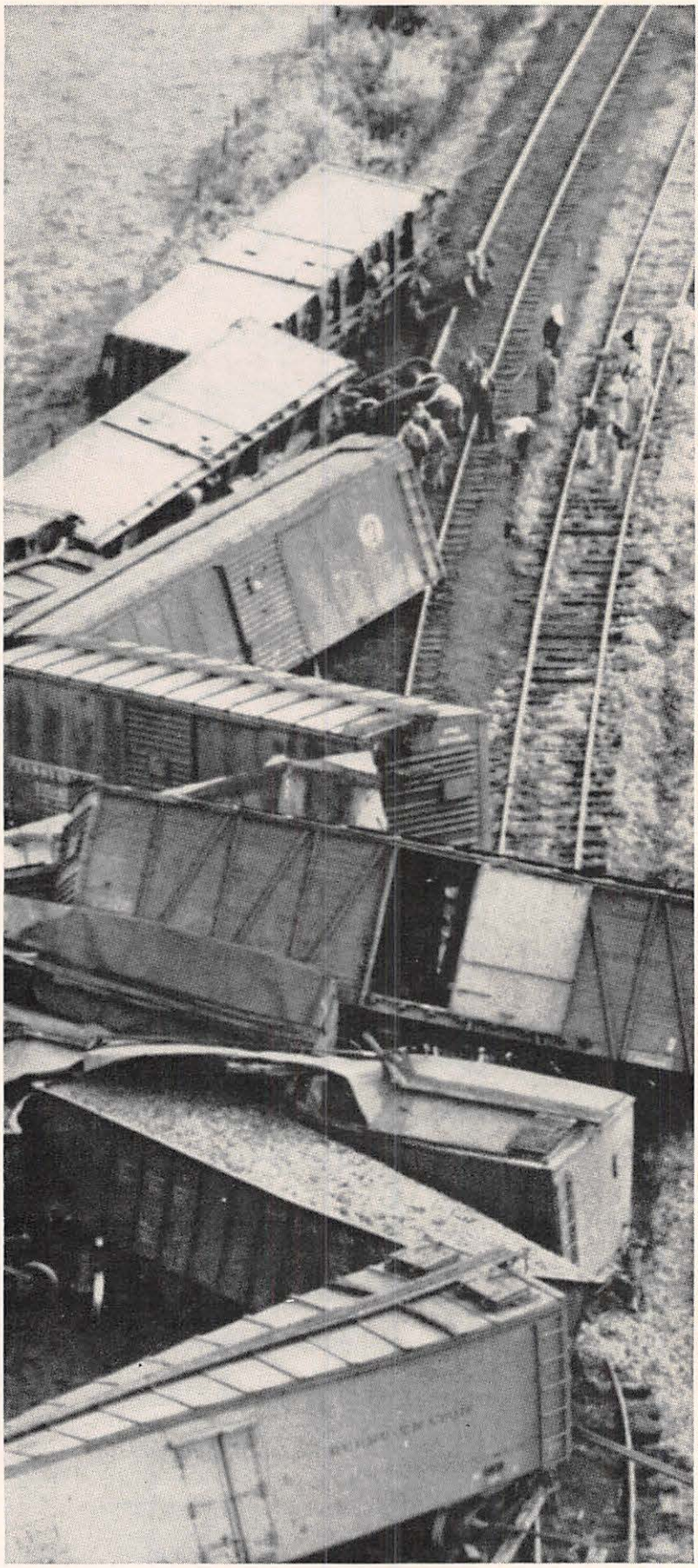

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RAILWAY SIGNALING AND COMMUNICATIONS

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Published monthly by Simmons-Boardman Publishing Corporation, 508 Birch St., Bristol, Conn. 06010, with executive office at 30 Church St., New York, N.Y. 10007. Second class postage paid at Bristol, Conn. 06010 and at additional mailing offices.

Member of the Audit Bureau of Circulations (A.B.C.) Name registered in U.S. Patent Office. Printed in U.S.A. by the Johnson Press, Inc., 800 North Court St., Pontiac, Ill. 61764.

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Subscriptions: Address all subscriptions and correspondence concerning them to: Circulation Department, Railway Signaling and Communications, P.O. Box 961, Bristol, Conn. 06010. Change of address should reach us three weeks in advance of the next issue date. Send old address with the new, enclosing if possible your address label. The Post Office will not forward copies unless you provide extra postage. Duplicate copies cannot be sent.

Subscription price to railroad employees only in U.S., Possessions, Canada and Mexico, $3.00 one year, $5.00 two years. All others $6.00 one year, $9.00 two years. Payable in advance and postage free. All other countries: $8.00 one year, $16.00 two years. Single copies 75¢.

POSTMASTER SEND FORM 3579 TO P.O. BOX 961, BRISTOL, CONN. 06010.

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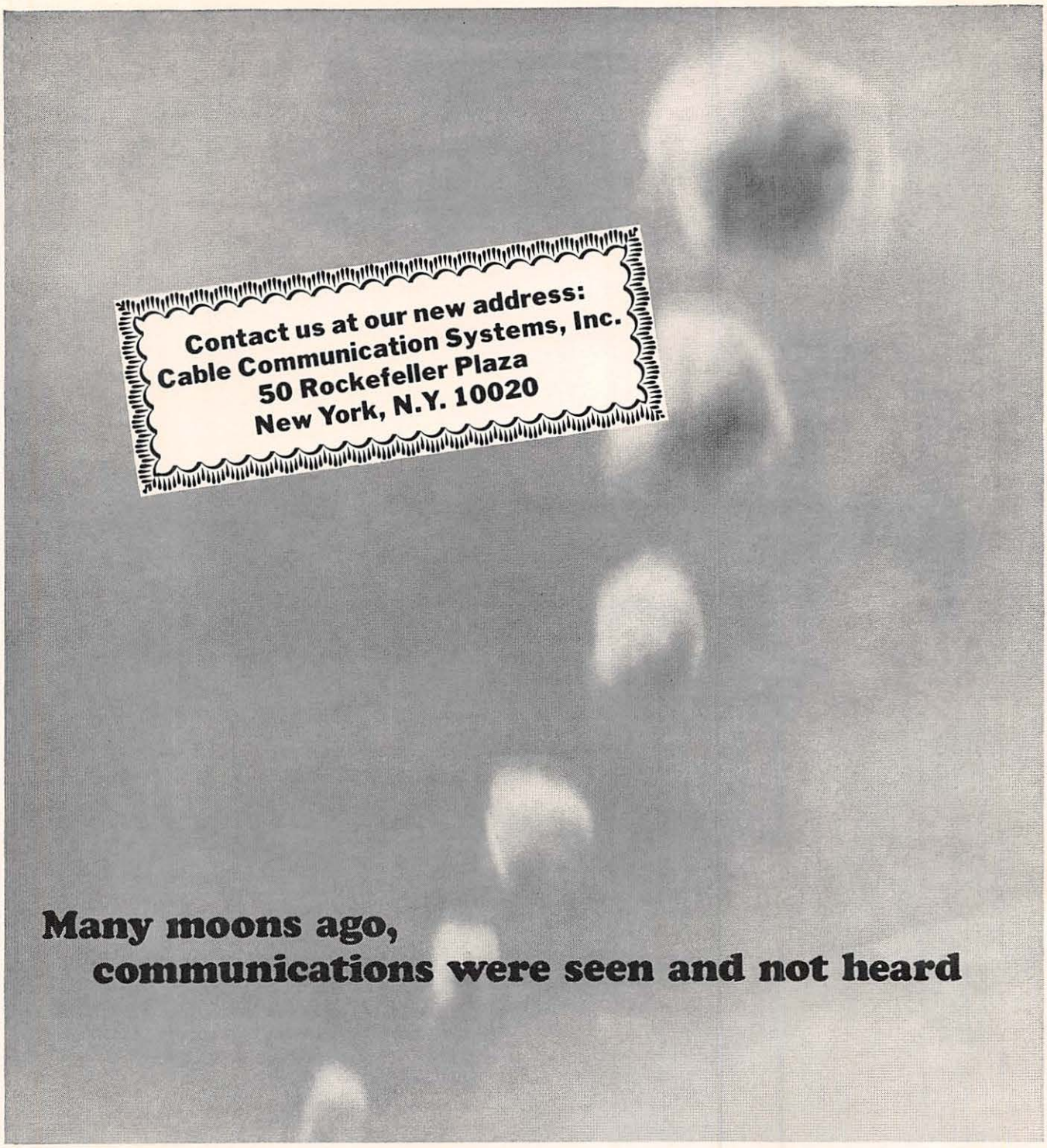
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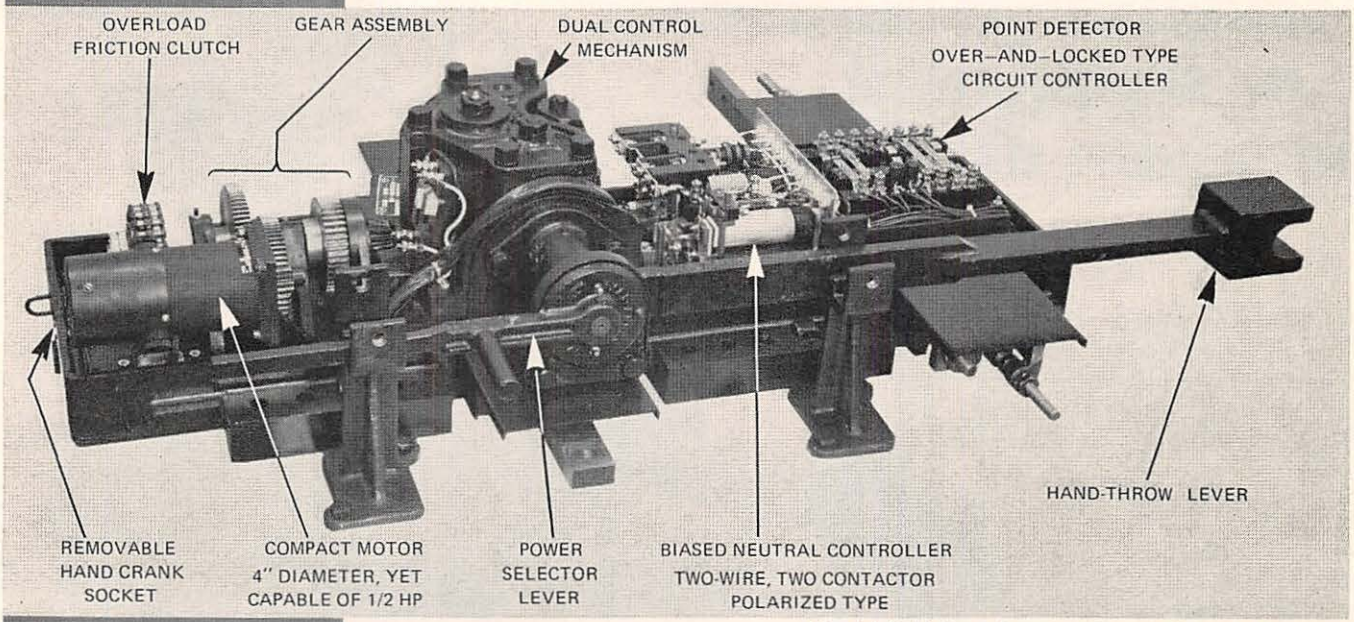
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55G	No	Yes 10/24 v. d-c	24 d-c or 110 d-c or 110 a-c
55H	Yes	Yes 10/24 v. d-c	24 d-c or 110 d-c or 110 a-c

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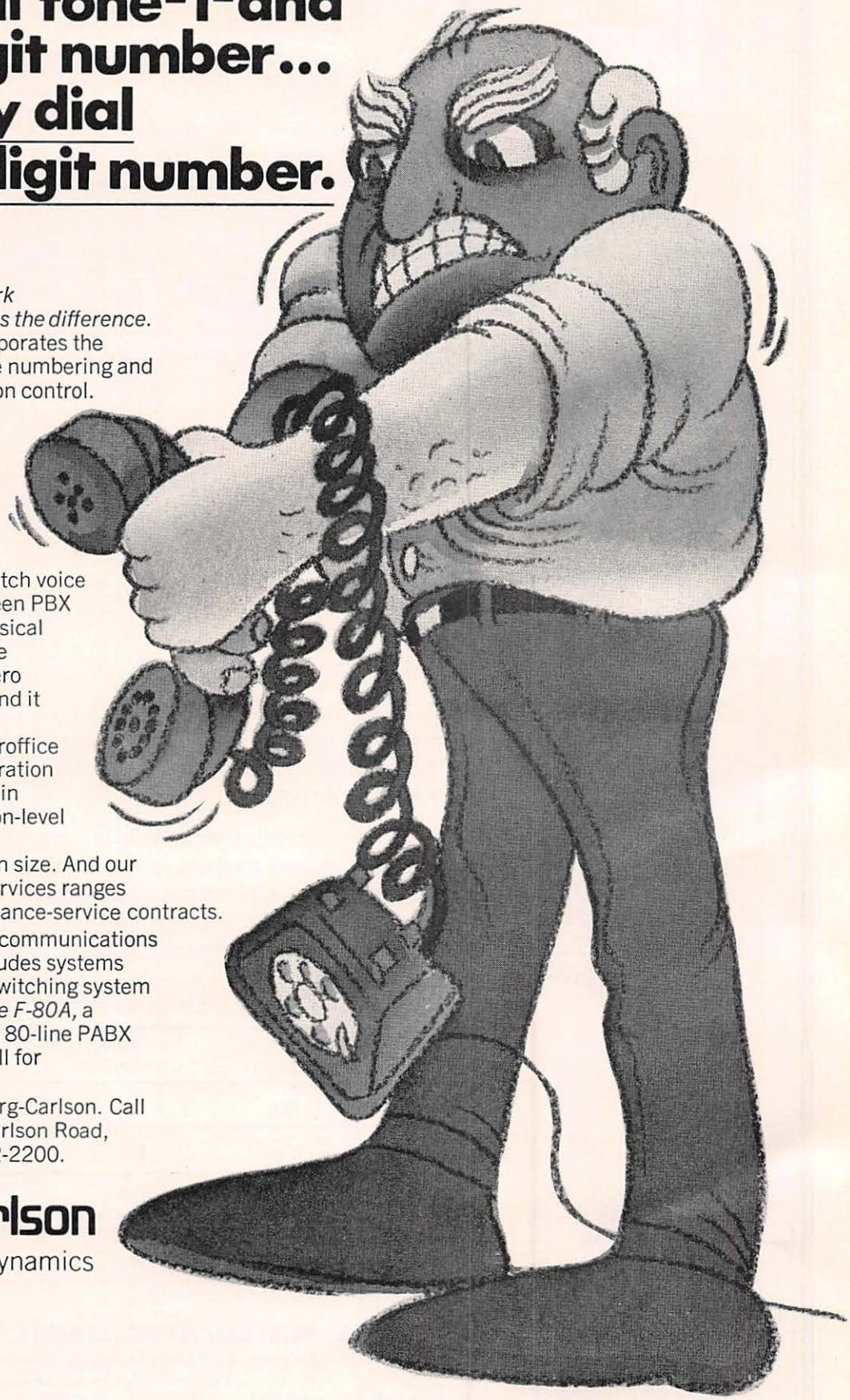

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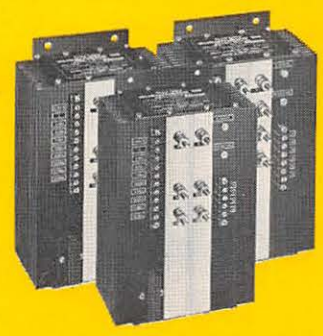

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MODELS TCB-2, TCB-4 AND TCB-6

HIGHWAY CROSSING FLASHERS
MODEL EOR

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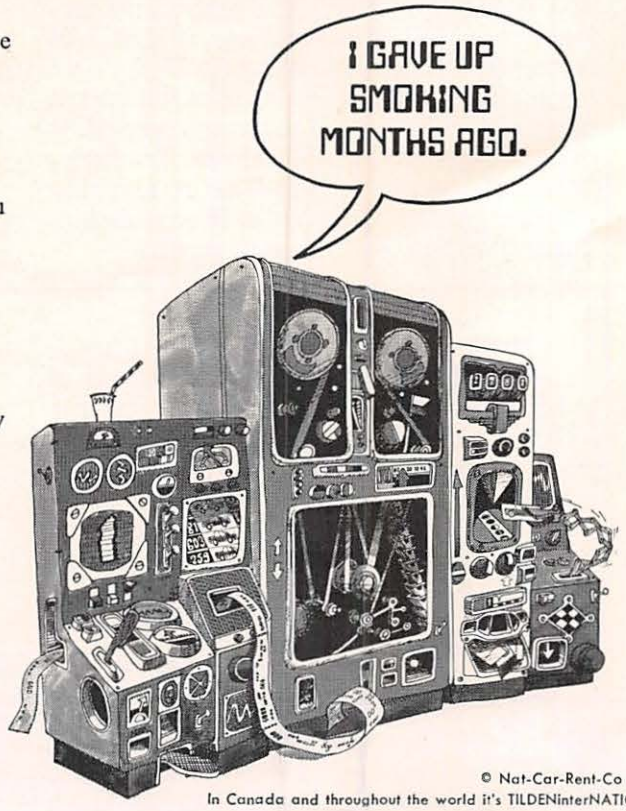

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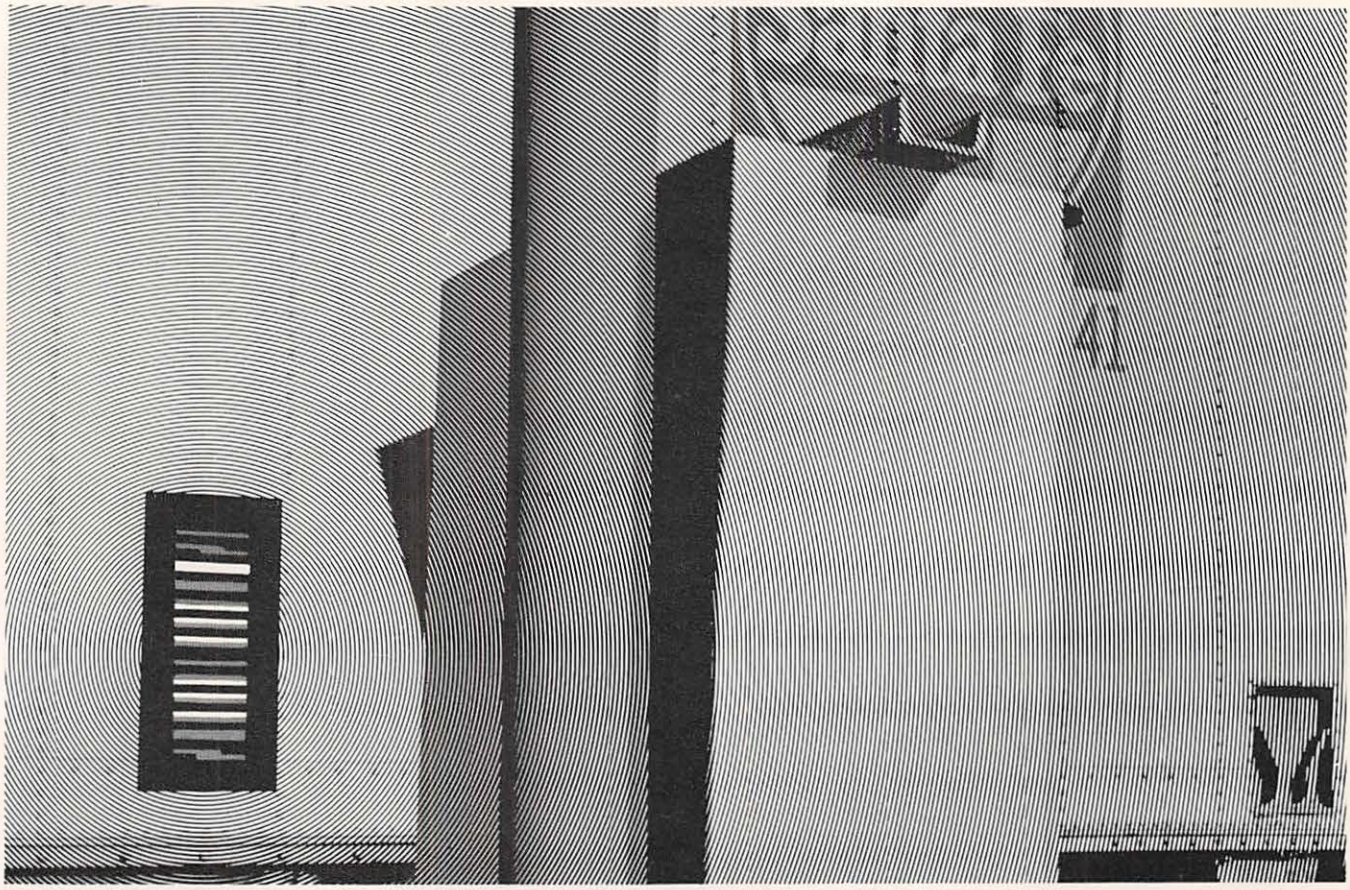

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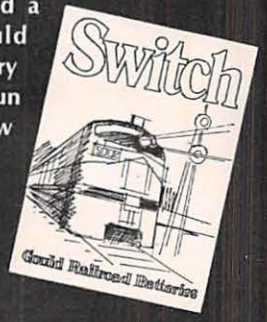

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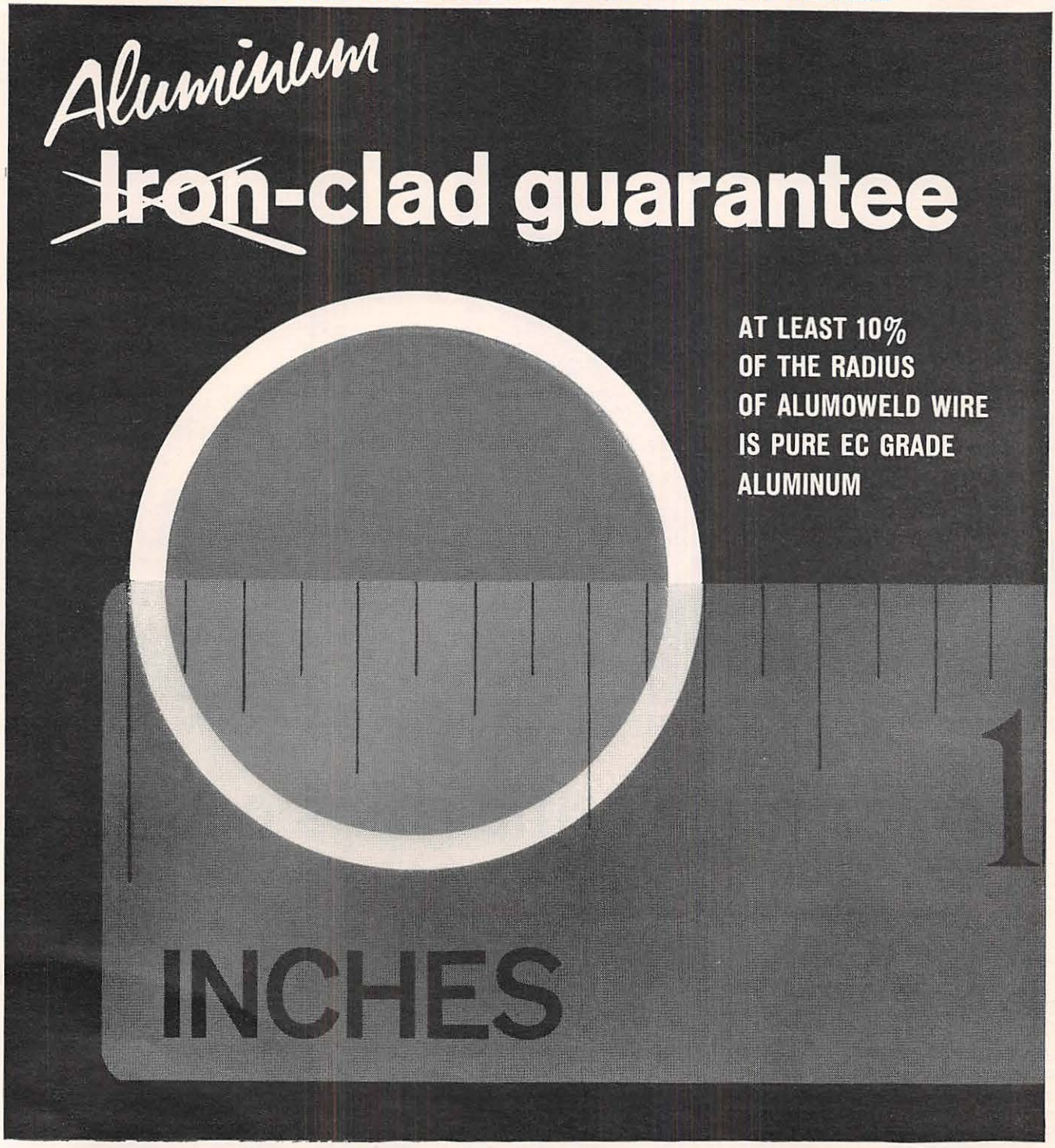

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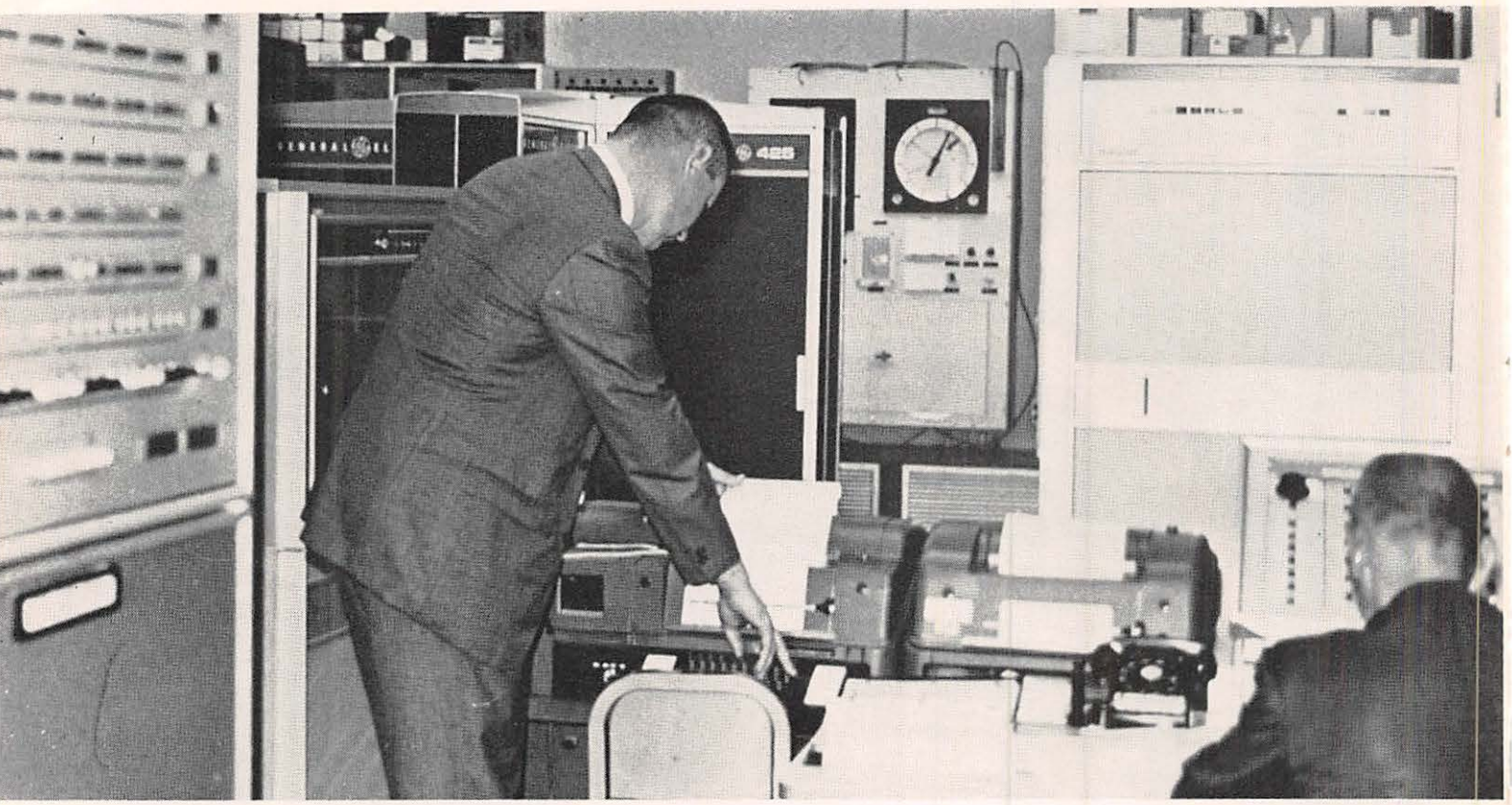


MANAGEMENT INFORMATION & CONTROL SYSTEM key unit is GE DataNet 30 computer that handles message switching.

Western Pacific gains control via

MANAGEMENT INFORMATION

Planning and implementing Western Pacific's Management Information and Control System was handled by computer and systems experts. But it was a cooperative effort that also involved operating and communications men as well as support from management. Study and planning for MICS began in 1962, with the first system cutover in 1967. During one 6-week period, a WP business car carrying Teletype equipment toured the railroad as a rolling classroom. It was used to train field personnel in the use of the new Teletype equipment and procedures for MICS.

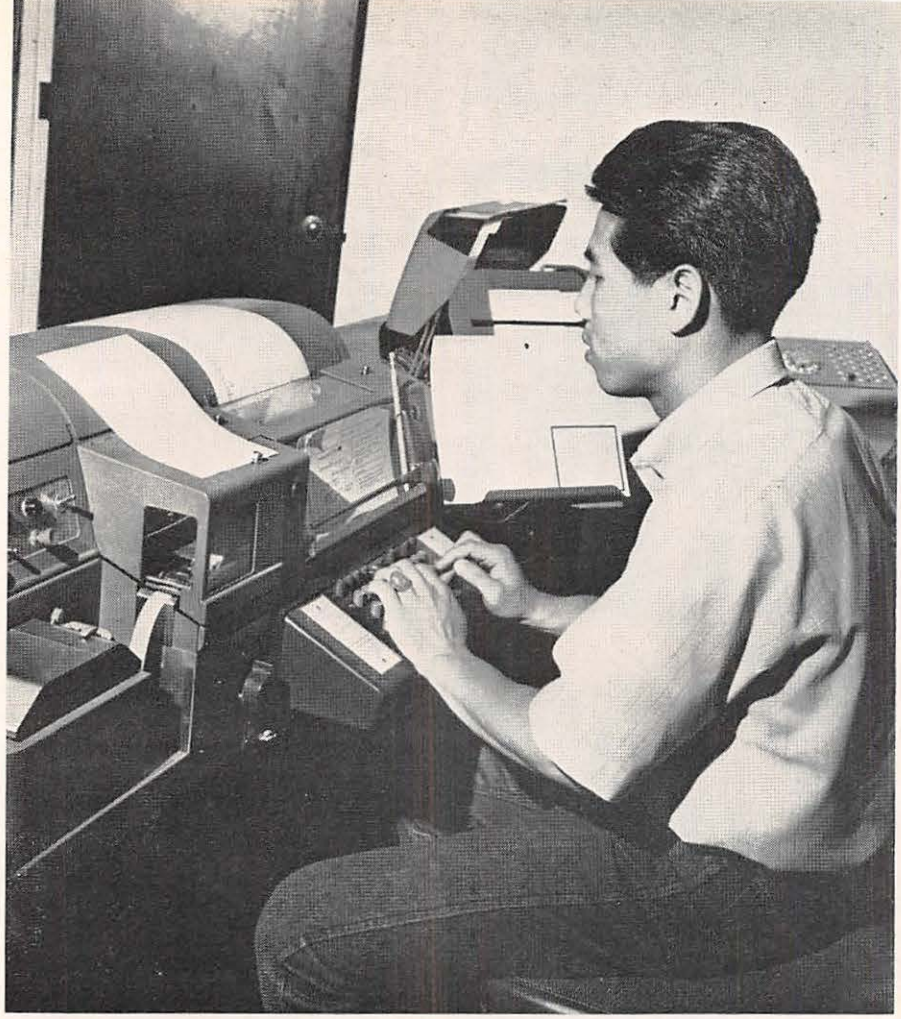
All during the five years of planning, installing and programming for MICS, WP's management showed continuing interest and support. Today, Management Services Director R. L. Petersen, reports to WP President M. M. Christy.

MICS is entering its fourth phase—the first three are car distribution, car tracing and waybill data handling—where management information can be developed on a real-time basis. Daily revenue estimates and market forecasts can be produced to give management the timely information it needs to know in order to manage.

A computer-based Management Information and Control System is providing Western Pacific with the capability of obtaining maximum utilization of freight cars on its lines. Also, MICS is helping WP keep its per diem costs at manageable levels. This is particularly important for WP because it terminates more carloads than it originates.

For the shipper, MICS provides instant car tracing information, plus better distribution of empties for loading. The car distribution phase of MICS has been "on stream" for about a year, while the tracing system (CLICS—Car Location Information Computer System) has been operational for several months. A third phase of MICS, that of providing complete waybill data upon inquiry to the computer, is now under way. A fourth phase of MICS is to tie all the existing phases together to provide planning and forecasting capability to the freight car utilization function.

WP's car distribution system makes use of the computer as a storehouse and



INPUT TO COMPUTER is via Teletype units at offices and services centers.

its centralized computer

record keeper while strategically placing supervision in the field. WP set up 11 service regions along its lines from Oakland, Calif., to Salt Lake City, Utah, and its inside gateway connection north from Keddie, Calif., to Klamath Falls, Ore. In each of the 11 regions is a service center staffed with a regional car distributor. Prior to MICS, car distributors were located at Elko, Nev., and Sacramento, Calif.

Basic to WP's car distribution system are two tenets: (1) Cars are cleaned and inspected at the nearest facility after being unloaded; and (2) Cars are moved between regions only on specific orders, directly from the Superintendent of Transportation's office in San Francisco headquarters.

The procedures for making empty cars available for distribution for loading or if necessary for returning foreign cars empty, begins when they arrive in yards following unloading. Often they are spotted on cleaning tracks. They are inspected and car inspectors enter information about the condition of the cars on special card forms 200 or 201, depending upon whether the cars are box cars or open top and covered hopper cars. After inspection and cleaning (when required) is completed, the information on the form 200 or 201 is sent via Teletype to the WP computer center in the San Francisco headquarters office.

The computer has been programmed to analyze this information and issue a classification for each car. The classifications are in the form of codes that indicate the kind of car, the condition of the car, and the availability for loading status of the car. The car kind code is broken down so as to indicate size of the car, special loading devices, etc. The condition of the car (known as condition summary) indicates in general what type of load it can handle, such as lumber, machinery, bulk loading, etc. The availability status code indicates what restrictions if any, might apply, such as specific routing or commodity.

The computer automatically sends the car kind code, condition summary code and availability status code to the office sending in the information. This report also includes any exceptions to general rules that might apply to car movement. Upon receipt of the code information, these codes are marked on the form 200 or 201 for the particular car. These forms on manilla stock measuring 4¼" by 11", serve a double purpose. First to provide car condition information, and when required the form serves as an empty car waybill when moving the car for distribution from one region to another.

On the demand side, customers call either WP agents or sales representatives with requests for cars. The person receiving the call completes a form 220 Car Order that shows the customer's name, his assigned patron number, date and time car is required, date and time order is placed, commodity description, number of cars requested and type of car requested. This information is punched into paper tape and sent via Teletype to the central computer where a record is made.

Regional car distributors naturally try to fill their car orders from cars in their regions. When they fill an order, they notify the central computer via Teletype, so that the central file is updated. Upon request of the car distributors in the Transportation Center, the computer prepares a supply and demand report for each of the 11 service regions. Each region receives via Teletype, only its own region report, but the Transportation Center in San Francisco receives a consolidated report of all 11 regions.

Basically, the report shows car supply for system and foreign cars in various availability status codes broken down by car kind codes and condition summary codes. On the demand side are shown numbers of cars, again by car kind and condition summary under five types of orders such as car orders, distribution orders, surplus orders, standing orders and switch orders.

Car distributors at the Transportation Center check this report carefully, noting especially the surplus of cars and orders. Thus they find a region with a surplus of a particular kind of car and another region with a surplus of orders for the same kind of car. Accordingly, the car distributor issues a distribution order directing the surplus cars moved to the region short of those cars. This order is sent to the computer so that it will update the file on the car inventory for the two regions involved. WP gives the same priority to moving empties as it does to moving loaded cars. It does so for two reasons: (1) to give the shipper better service by promptly fulfilling his car requirements, and (2) helps keep per diem costs down

THEODORE P. WROBLICKY AND ROBERT L. PETERSEN are manager, on-line systems (left) and director, management services department, respectively.

by promptly moving surplus foreign line empties off the line.

As an aid in knowing which cars to move, certainly the foreign line cars, an auxiliary report is printed out by the computer when it prepares the supply and demand report. This report shows by car initial and number, whether it is a load or empty, car kind, availability status, condition summary, car order (if under such an order), location (yard or in a train), date arriving at present location and remarks. This latter category indicates if the car has been over 72 hours at the present location.

Because more cars terminate on WP than originate, this 72-hour detention is especially helpful in alerting car distributors about foreign line cars. Kenneth Plummer, WP's superintendent of transportation, says that as the system is perfected and few 72-hour detention cars show up on the report, then he anticipates that he will ask for the computer to flag cars detained 48 hours or more. Hopefully, they can work down to a 24-hour detention flagging period.

Biggest advantages of the MICS function, says Plummer, is "getting the potential maximum utilization of freight equipment. Also, we can get foreign cars moved toward their owners, with or without loads. And, we will get control of excessive detention of cars." It has been estimated that an empty car not being utilized costs WP $16 a day in per diem and lost revenue.

The MICS operation also provides for inquiry to the computer for information concerning cars reported on the supply and demand reports, and the auxiliary report. Also, car location information is available. In addition to car utilization information, the computer uses the AAR's UMLER (Universal Machine Language Equipment Register) file in real time. The car kind code is developed from UMLER. Thus from any Teletype location, five types of inquiry can be handled by the computer. (1) Specifications and dimensions of a specific car. (2) Listing of car kind code, condition summary code, availability status code, present location and condition summary detail. (3) Complete listing of a specific car order (must indicate ordering station and order number). (4) List of detail for car utilization. (5) List of last reported location time and date.

CLICS, or Car Location Information Computer System, became operational in July 1969. Train consists are sent into the computer via Teletype and contain such information as train identification number, date and time of the report, and movement record code indicating departure or passing, arrival or delivery at a junction (entire train or for individual cars). Simultaneously, the report is sent from the originating yard to the next yard and to the computer center. When cars are reported for the first time, the computer checks them against UMLER for validity. If it does not pass this check, the computer automatically asks the sending station to send a correction. If there are 10 or more errors in a train consist, the computer rejects it and asks for a retransmission. Trains passing through yards are reported, bad order cars are reported, and the central file is continuously updated.

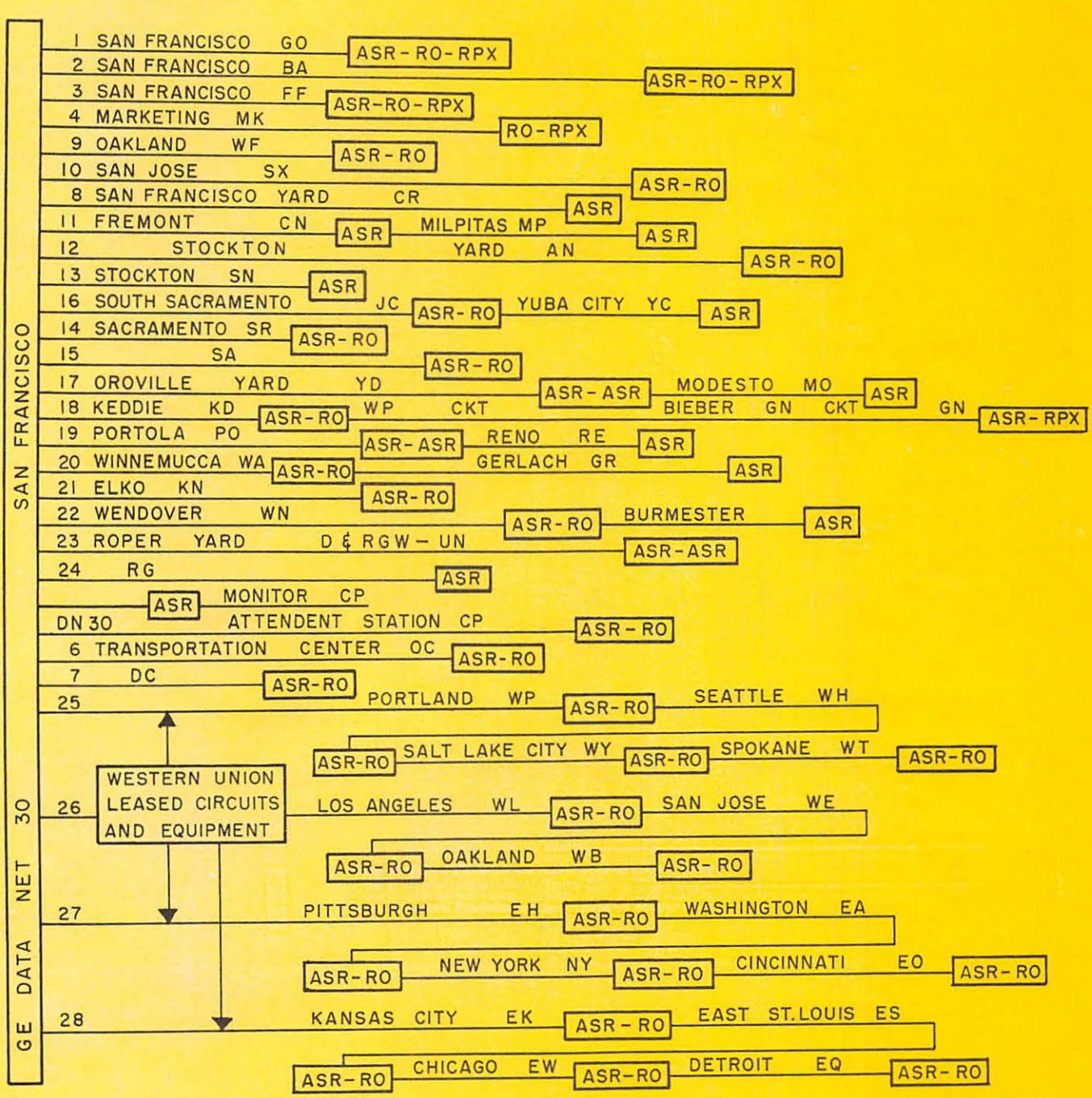
Car Location Messages, known as CLMs are sent daily to major customers via Western Union's Telex service. Also, any of WP's twelve off-line or six on-line sales offices can inquire via Teletype to the computer for car location information. A daily PARD (passing, arrival, delivery) report is mailed to sales offices and representatives not equipped with teletypewriter equipment to assist personnel in car tracing. A computer produced Jumbo report is also made available to the transportation department at WP headquarters.

At present, train consist information shows cars as loaded or empty. Work is now underway to include full waybill data on the first report of a loaded car. This is the third phase in the development of the MICS operation.

The heart of MICS is a pair of CPU's (Central Processing Units) electronically connected. One handles message switching and the other CPU is the MICS central computer. Both are General Electric DataNet 30 computers with three disc files, eight magnetic tape units, a high-speed printer, and card reader. As far as the message switching system (known as Message Switching and Data Collection) is concerned, the MICS computer is just another station (actually it is station PI).

Connected to the MS/DC DataNet 30 are 28 Teletype circuits, operating at 75 wpm. These circuits connect 27 on-line WP stations, 5 offices in the San

WP HAS 28 CIRCUITS FEEDING TELETYPE EQUIPMENT IN ITS MICS NETWORK.



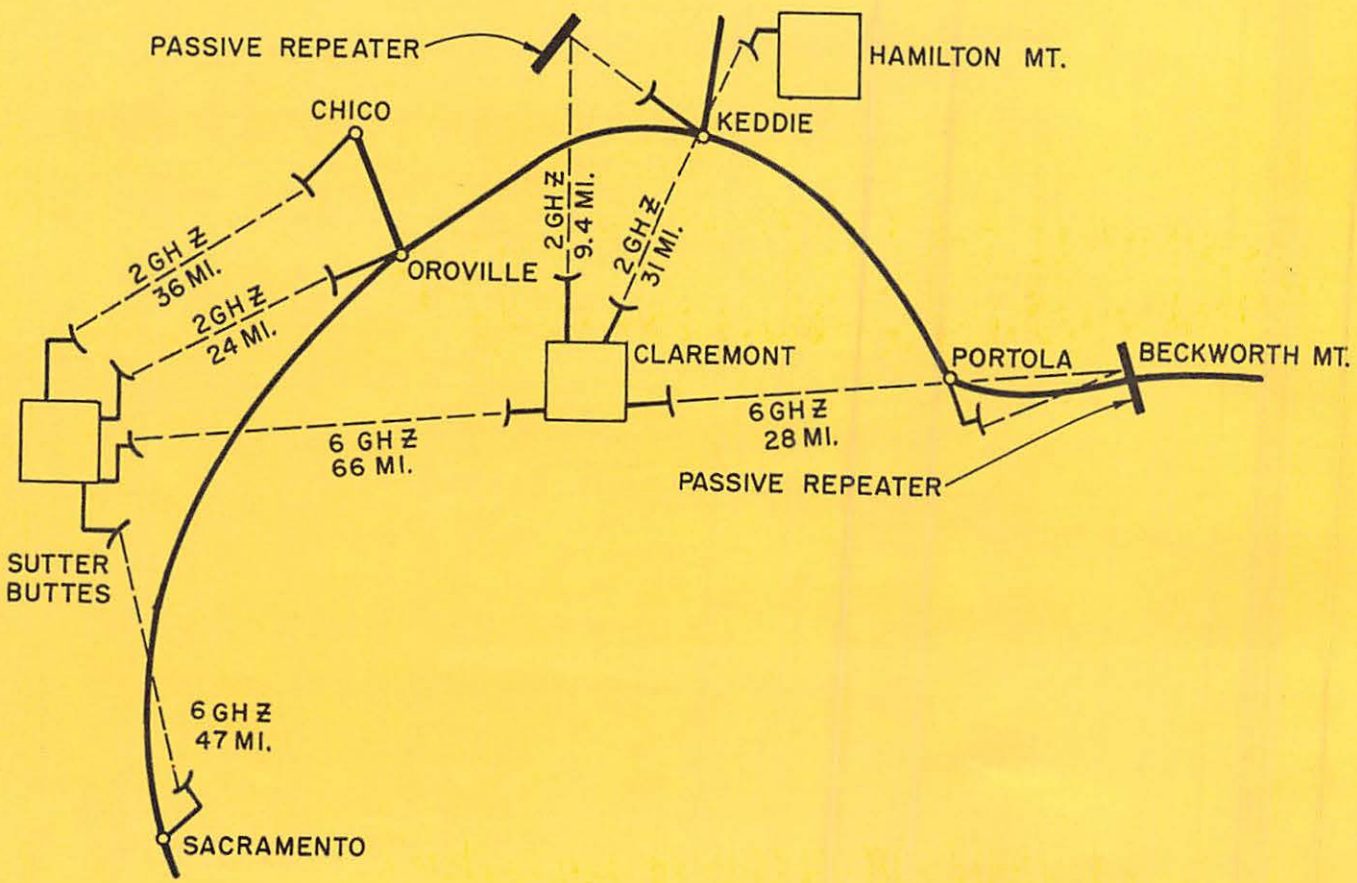
ASR = MODEL 28 TELETYPE AUTOMATIC SEND-RECEIVE 75 WPM

RPX = MODEL 28 TELETYPE TYPING REPERFORATOR

RO = MODEL 28 TELETYPE RECEIVING ONLY PAGE PRINTER

KEY STATIONS ON-LINE ARE LINKED VIA TELETYPE TO SAN FRANCISCO COMPUTER

WESTERN PACIFIC MICROWAVE EXTENDS FROM SACRAMENTO EAST TO PORTOLA



COMPUTER KEEPS EVERYONE "IN TOUCH"

Francisco headquarters, 12 off-line sales offices, and 3 on-line sales offices. Western Union leased circuits and equipment cover the off-line offices. Equipment is generally Teletype model 28 ASR (automatic send-receive) units with keyboard and reperforator. Some offices have separate typing reperforators, such as the marketing department and the general telegraph office in San Francisco. Traffic studies were made to determine the number of stations that might be on a line, hence the busier stations have a direct line to the MS/DC computer. The computer polls each station in turn. If there is something in the station's transmitter, then it sends the message to the computer, if not, the computer polls the next station in the polling sequence. Message switching is on a store and forward basis.

The MS/DC computer develops "rotor" station capability for those locations having traffic loads in excess of one Teletype machine. For example, "BA" and "FF" are the first and second "slave" rotors to station "GO". Traffic routed to GO is internally routed to BA or FF if GO is busy. In these instances, the traffic will conform to GO sequence numbers and header data. Similarly, AN is the Stockton master station and SN is the Stockton slave unit. SR is the Sacramento master unit and SA is the Sacramento slave unit. To preserve this relationship, the MS/DC computer will reject any message that is routed to any slave rotor station. On-line stations equipped with Teletype are shown on the map on the opposite page. Cities in heavy type, such as Keddie, are regional service centers.

Messages coming to the computer are sent into core and checked for valid sequence number, determined if the station routing is valid and the header is correct. If correct, the message is placed in a Queue on a disc file for the individual station to which it is to be sent. Full duplex operation is achieved on all circuits. The computer polls a station twice, first to receive messages, and second to transmit messages to the station. If a sequence number is incorrect, the message is rejected and the computer asks the station to check and retransmit the message. Each station numbers its messages, train consist reports, etc., going from 1 to 999, and then repeats. The computer keeps track, and also generates its own sequence number for messages it sends to stations.

Administrative messages are held in disc files for four days, and up to that time, stations can request a retransmission to them of a message. Car movements are kept on disc file 7 days after interchange off line. As space is needed on the disc files, a demand-destruct operation occurs in which new information is overlaid and replaces old information. Information concerning car orders and car classification is permanently stored on magnetic tape.

Three types of priorities have been programmed into the message switching system. R is rush, which means give top delivery priority but keep message in sequence among other rush messages if there is a queue of waiting "R" messages. I is rush but ignore incoming sequence. N is normal handling. Thus everything is treated as normal unless it is coded R or I.

Message Switching on line in '67

The message switching system was cut into service in September 1967. This was the first portion of WP's Management Information & Control System to go into operation after initial planning began in 1962.

Development and implementation of the management information & control system was directed by Robert L. Petersen, director management services department. It was a cooperative effort that involved operating, marketing and the signal and communications departments. Computer system design and programming was directed by Theodore P. Wroblicky, manager on-line systems with W. J. Burnside and R. L. Rademacher, project supervisors, directly responsible for the programming of MICS.

Working closely with management services department was Robert E. Enger, superintendent of communications, to provide communications circuits and install the necessary Teletype equipment. Expansion of the use of MICS and with plans to always keep ahead of the communications requirements of the railroad, Enger is now directing the installation of a microwave system that will extend from Sacramento to Portola, Calif., 180 miles by railroad. But the microwave line-of-sight signal will be somewhat shorter. The backbone system, operating in the 6GHz range, will be Lenkurt Electric 78B1 equipment, with common equipment capable of expansion to 120 voice channels. This backbone system will go from Sacramento north to a repeater at Sutter Buttes, 47 miles; then 66 miles to a repeater on Claremont mountain, from which the microwave signal is beamed 28 miles to a passive repeater on Beckwourth mountain where it is reflected 2.6 miles to Portola station. From the Sutter Buttes repeater, 2GHz legs (Lenkurt type 71F2 also capable of up to 120 voice channels) will go direct to Chico and Oroville, 36 and 24 miles, respectively. Another 2GHz leg will be beamed from Claremont mountain 9.4 miles north to a passive repeater near Keddie where it will bounce to Keddie, another 0.4 mile. Still another 2GHz path will extend WP's communications 31 miles north of Claremont to Hamilton mountain.

The microwave installation in the mountains of California is but a beginning as WP beefs up its communications links in its vital Management Information & Control System. WP is planning to extend its microwave system during 1970 from Sacramento to headquarters in San Francisco.

At what might be called the "three-quarter mark" in developing and implementing the MICS program, the Petersen team is not content to rest on past performances. The next phase, that of tying in all the bits and pieces, says Petersen will be difficult but the most rewarding. This means real time operation, where such things as daily revenue estimates can be made, and various other marketing, and planning techniques utilized to really give management the information it needs to know in order to manage. And for those looking for clues as to the importance of MICS, Management Services Director Petersen now reports directly to M. M. Christy, WP president.

WP lived up to its slogan—"Willing People" because that's what has made MICS the tool that has given WP control via the computer.

C&S expenditures for 1970

Railroads and transit authorities in U.S. and Canada are planning to spend $81.9 million for communications and signal equipment.

Plans for equipment installations in the area of signaling and communications look bright for the first year of the decade of the Seventies. U.S. and Canadian railroads and transit authorities are planning to spend 44% more money in 1970 for signal equipment than they did in 1969. On the communications side, equipment expenditures are slated for a 9% rise over the previous year.

Forty-two reporting companies plan to spend $45,395,159 during 1970 for signal equipment, while 45 companies and transit authorities plan to spend $36,484,553 for communications equipment in 1970. If these spending plans hold up, then an estimated 6,900 units of signal equipment will be installed during the year. Based on the same extension for communications, about 28,400 units of equipment will be placed in service by railroads and transit authorities during 1970. Although the January 1969 predictions did not hold up, there is mounting evidence that the this years plans will proceed to completion. For example, some roads' signal projects that were stretched out for another year or two will be pushed to completion during 1970. Also, training programs have been started by several railroads for their new and unskilled signal workers. The results this year will provide men for installation work. On the communications side, 1969 was a breather for installations, but was heavy in planning for 1970 and beyond.

As for 1970, here is a listing of major project areas that signal and communications officers will be directly involved in planning and installations.

—Install automatic car identification systems. Indications are that as many as 200 scanners may be installed during 1970.

—Upgrade existing pole lines, including stringing of new wire, mostly insulated. Also, many railroads indicated that existing wire pairs will be transposed for 30 and 150 kHz circuits.

—Complete replacement of vacuum-tube radio sets with transistorized units. Extend dispatcher control of wayside base radio stations to provide complete mainline coverage. Several roads indicated installations of radio repeater and relay base stations to provide coverage to all mobile units in a territory including off and on-track vehicles.

—Expand direct distance dial telephone service by installing new automatic telephone exchanges and increasing circuit capacity with new carrier equipment. Several railroads will install 4-wire switching equipment to improve service and reduce transmission losses.

—General upgrading of circuits for data transmission will be undertaken during the year. Several railroads will complete extensive microwave systems, while newcomers to the microwave field will expand their initial systems. Space diversity (providing for two transmission paths) will be added to some existing systems to improve reliability.

—Extensive installations will be made of audio frequency track circuits in welded rail territory at highway grade crossings to eliminate the need for insulated joints. Some railroads are using the audio frequency circuits for crossing protection even where welded rail is not a factor because of the savings in first cost and maintenance by not requiring insulated joints for determination of track circuit boundaries.

—Along similar lines, several transit authorities are installing cab signal systems with high frequency track circuits; again an advantage is the elimination of insulated joints. Also, the cab signal system eliminates the need for wayside signals and automatic train stop trips.

MANAGEMENT INFORMATION

Signal and communications officers will be asking for more money in 1970 to install new equipment and systems. Reports from 42 railroads and transit authorities in the U.S. and Canada indicate that spending for signal equipment should reach $45 million. Forty-five railroads and transit authorities are planning to spend $36 million for communications equipment and facilities.

For the communications officers it will be the continuing task to keep even with or a little ahead of the needs of computers and management. Real-time computer systems are now considered essential for good management. On the programming side, there will be efforts to keep the paper flow down to manageable levels, or even reduce the amount of reports going to managers.

Wider application will be made of visual display units to provide instant retrieval of computer generated and stored information. Managers and key marketing and sales men will be prime users of these visual display devices.

Signal engineers, while involved with the glamour of computers in automatic classification yards, will be re-evaluating and examining existing signal plants to determine where further economies can be made by installing new and improved equipment.

With the freight car fleet to be completely equipped with automatic car identification labels by June 1 this year, extensive plans will be implemented for ACI systems. This effort, reports one road's general manager, will require the cooperation of several departments, such as signal and communications, operating, industrial engineering, data processing, mechanical and engineering. Biggest payoff for ACI, say many experts, is by use of the data in computer analysis. By automatically providing data on vehicle identification along with a time and date, the uses of such data are almost endless. Programming of maintenance schedules for vehicles can be prepared from such ACI-generated data. There are many others that can be determined by examination of present operating and maintenance practices.

show gain of 26% over 1969

—Extensive radio systems will be installed or completed by transit authorities during the coming year. It has become a standard to equip all vehicles (transit cars, buses and maintenance units) and personnel such as supervisors, and policemen with radio sets.

—Centralized dispatching and control headquarters for railroads and transit authorities are being installed. From such centralization, better and more effective control of operations is obtained. With such centralization, extensive communications facilities must be provided, hence communicators will be kept busy. Several railroads plan to centralize readouts from hotbox detectors at the dispatching headquarters. Dispatchers will use radio to notify train crews of overheated journal conditions.

—For transit authorities, closed circuit television and loudspeaker systems will provide the communications necessary to contact people on station platforms. CCTV will give supervisors the ability to see what's going on, and intercom systems will give them the ability to talk to passengers.

—Increasing installations will be made during the year of detector pairs —hotbox and dragging equipment. Wheel counting units, a necessary part of hotbox detectors, will provide information on location of cars within trains that trip dragging equipment detectors.

For the new year and the decade ahead, computer specialists, including programmers will be refining programs and techniques to bring the paper avalanche down to a manageable trickle for management. While the decade of the Sixties saw the extensive application of the computer, the Seventies should see refinements and improvements in computer reports. Some experts envision the application of small special-purpose digital computers to take the paper or data flood from the giant computer and produce refined and edited reports for top management. Such systems would utilize a variety of visual display techniques to make information more understandable to managers.

The decade of the Seventies will probably witness the greatest expansion of communications facilities than ever before. Growth of company-owned facilities will continue, and the new specialized communications common carrier will provide competition for the telephone and telegraph companies. Managers will have much to choose from as regards equipment and services in the areas of communications and computers.

Recent filings to the Federal Communications Commission involve two groups of companies that intend to provide specialized data transmission capabilities across the United States. Microwave Communications Inc., and associated companies have proposed a nationwide microwave network to furnish data transmission facilities. Data Transmission Co., a subsidiary of University Computing Co., has informed FCC that it wants to construct a Boston-San Francisco microwave network covering 35 major metropolitan areas. Datran would have 10 district offices for computerized switching and plans to seek interconnection rights with the communications common carriers.

Communications explodes in '70s

These two private ventures plus the communications services available from the Bell System and Western Union will give manangers a wide choice of leased equipment and services. For railroads, the wide variety of equipments available from manufacturers adds an even greater "supermarket" of communications gear from which to choose.

Southern Pacific Co. has told the FCC that it intends to offer communications services to the public over its 6,000 mile private microwave systems operated by Southern Pacific Transportation Co. the railroad). SP is opposing MIC's plan to install a Pacific Coast microwave system.

At the moment, the increased Telpak tariff rates for bulk communications have been suspended until February 1. Although it suspended the tariff, FCC may be faced with court action by some to hold off allowing the tariff to go into effect until the basic telephone rate case is settled. At least for now it appears that Telpak is again "up in the air," but communications managers, warns one railway communications officer, would be well advised to expect increases in common carrier rates, and plan accordingly.

With the interchange freight car fleet scheduled to be equipped with automatic car identification labels by June 1, 1970, this year will witness a full-scale push for installation of ACI scanners. Indications are that as many as 200 scanners will be ordered this year. Immediate payout will be for checking inbound and outbound trains at major yards. A few railroads have already made plans to place ACI scanners in approach to weigh-in-motion scales for identifying cars. Weight of the cars can be associated with the proper car via computer logic functioning. Most such installations will be tied in with central computers for producing train consist and waybill information reports.

1970 might see the breakthrough in the widespread use of optical scanners or character recognition devices. Such units could provide direct input of data from documents to computers or to punched paper tape or magnetic tape thus bypassing key punching of cards. OCR devices not only operate at higher speeds than key punches, but they can eliminate the human error, and of course, the human operator. The biggest payoff, say some rail managers, would be in adopting a standard waybill format which could be read by OCR devices for direct input to computers.

For signal officers, 1970 may be somewhat of a return to fundamentals, that is, make cost-benefit analyses of proposed signal projects, then sell them to management. One signal engineer says that interlocking consolidations offer a prime area of savings on investment. Also, the automatic interlocking, often neglected because it is not glamourous, can produce savings in labor costs.

Another area of re-evaluation in that of centralized traffic control utilization. Computer simulation of train operation, plus analysis of CTC train graphs have indicated on some railroads that some passing sidings are under utilized. Adjusting of train schedules or re-arrangment of controlled sidings can bring about operational improvements, plus the benefit of removing some signal equipment that is not used or little used.

C&S 1969 DATA: PAGES 24-25, 28-29 ▶

RAILROADS INSTALLED OVER 4,000 RADIO UNITS IN 1969

Railroad	Two-way Radio			Intercom Systems			No. of	Telephone	
	Mobile Units	Fixed Stations	Portable Units	No. of Systems	Loud-speakers	Tele-phones	Microwave Stations	Ex-changes	Stations Available
Alaska	9	—	—	—	—	—	—	—	—
A&WP	3	—	4	—	—	—	—	—	—
Georgia	3	1	5	—	—	—	—	—	—
WRyA	3	—	4	—	—	—	—	—	—
A&StAB	2	—	3	1	1	—	—	—	—
BRyC	4	—	—	—	—	—	—	—	—
B&LE	4	1	10	—	—	—	—	—	—
Burlington	42	10	25	2	40	5	—	—	30
C&S	3	1	—	1	28	—	—	—	—
FW&D	19	—	2	1	4	—	—	—	—
CN	40	59	106	3	104	37	7	7	1400
CP	794	250	864	1	17	137	4	7	339
C&O/B&O	83	21	167	3	41	46	—	1	150
C&NW	19	1	20	2	22	12	7	2	120
CTA	2	—	—	4	47	52	—	—	—
Cleveland TS	85	—	—	—	—	—	—	—	—
D&H	44	5	38	—	—	—	—	—	—
DT&I	4	1	4	1	—	6	—	—	—
DM&IR	8	2	10	—	—	—	—	—	20
EJ&E	28	—	3	2	—	—	—	—	—
Frisco	27	5	12	2	10	—	—	—	—
GN	46	6	120	3	47	34	—	—	—
GB&W	—	—	6	—	—	—	—	—	—
GM&O	22	2	18	—	—	—	—	1	—
IC	136	14	97	2	15	8	34	2	550
KCT	12	2	4	3	—	—	—	—	—
K&IT	—	1	4	—	—	—	—	—	—
L&HR	1	—	—	—	—	—	—	—	—
LV	2	2	10	1	—	12	—	—	5
L&N	141	2	—	7	22	2	8	3	64
MBTA	150	3	20	4	80	—	—	—	—
MTA-LI	159	1	12	4	29	12	—	—	—
Milwaukee Road	8	3	30	—	—	—	—	—	4
M-K-T	34	—	—	—	—	—	—	—	—
MP	18	13	13	—	—	—	—	—	—
C&EI	1	—	—	—	—	—	—	—	—
T&P	32	—	2	—	—	—	—	—	—
Montreal, CdeT	8	—	2	5	88	400	—	—	—
Monon	22	—	16	—	—	—	—	—	—
N&W	158	6	62	1	19	60	—	—	—
NP	70	3	28	1	50	—	54	12	275
PGE	29	2	6	1	5	—	2	—	—
PC	275	20	75	7	118	—	—	1	60
Reading	12	6	—	—	—	—	—	—	—
RF&P	3	—	15	—	—	—	—	—	—
Rock Island	88	5	20	4	—	—	—	5	155
Santa Fe	252	2	—	—	—	—	—	3	—
SCL	131	5	260	1	123	25	—	1	25
Soo Line	34	3	9	1	10	—	—	1	60
Southern	106	17	10	5	30	—	—	3	135
SP	123	16	84	—	18	—	38	1	350
SP&S	12	2	22	—	—	—	—	—	—
TP&W	—	—	2	—	—	—	—	—	—
UP	105	12	72	—	3	—	24	4	220
WM	17	1	34	—	—	—	—	—	—
WP	15	6	9	2	40	—	6	—	—
SN	—	1	3	—	—	—	2	—	—
Totals	3,448	513	2,342	75	1,010	848	186	54	3,962

OVER 2,400 CHANNELIZING UNITS INSTALLED BY RAILROADS IN 1969

Railroad	Carrier Equipment — Terminals & Repeaters — Voice	Voice + Data	Data	No. of Tele-printers	No. of Computer I/O Units	No. of Data Modems	Pole Line or Cable Construction — Miles of Wire &/or Cable	Miles of Aluminum	Miles of Copper
Alaska	—	—	—	4	—	—	—	—	—
A&WP	2	—	—	—	—	—	10	—	—
Georgia	—	—	—	—	—	—	10	—	—
WRyA	2	—	—	—	—	—	10	—	—
BAR	—	—	—	—	—	—	11	—	11
BRyC	—	—	—	—	—	—	3	—	—
B&LE	—	—	—	—	—	—	10	—	10
Burlington	20	4	18	25	50	30	5	—	—
C&S	—	—	—	—	—	—	2	—	—
CN	550	360	192	2,211	—	75	1,187	937	72
CP	330	184	1,858	2,803	37	69	7	163	—
C&O/B&O	20	16	—	50	10	20	34	—	25
C&NW	74	8	4	—	—	12	2	—	456
CTA	—	—	—	—	—	—	13	—	—
DT&I	2	—	—	—	—	—	—	—	5
DM&IR	—	—	—	—	—	—	—	—	70
EJ&E	—	—	2	—	40	58	1	—	4
Frisco	—	—	—	2	30	—	4	—	8
GN	32	—	—	—	—	—	71	—	—
GM&O	4	4	—	—	—	—	—	—	—
IC	250	20	30	—	85	200	13	—	—
KCT	—	—	—	1	—	—	—	—	—
LV	—	—	—	—	—	1	18	—	18
L&N	44	—	6	—	—	6	163	—	160
MEC	—	—	—	—	—	—	1	—	—
MBTA	—	—	—	—	—	—	12	—	—
MTA-NYCTA	—	—	—	—	—	—	177	—	—
Milwaukee Road	—	—	4	20	—	—	—	—	74
M-K-T	—	—	—	—	—	—	72	—	30
MP	—	—	—	—	6	2	—	—	—
T&P	—	—	—	—	1	—	—	—	—
N&W	30	2	2	6	—	18	10	152	172
NP	24	—	21	7	36	74	10	—	—
PGE	10	—	2	3	—	2	2	—	—
PC	—	—	—	—	—	97	2	—	—
Rock Island	37	—	—	—	—	—	—	—	—
SCL	49	—	—	—	—	—	2	—	600
Soo Line	7	2	2	—	—	2	3	—	—
Southern	39	12	13	33	33	43	22	—	—
SP	226	14	70	3	190	300	—	—	—
SP&S	—	—	—	—	—	—	1	—	—
UP	76	6	50	8	40	50	7	—	—
WM	—	—	—	—	—	—	—	—	40
WP	56	—	—	—	—	—	—	—	—
Totals	**1,884**	**632**	**2,274**	**5,176**	**558**	**1,059**	**1,895**	**1,252**	**1,755**

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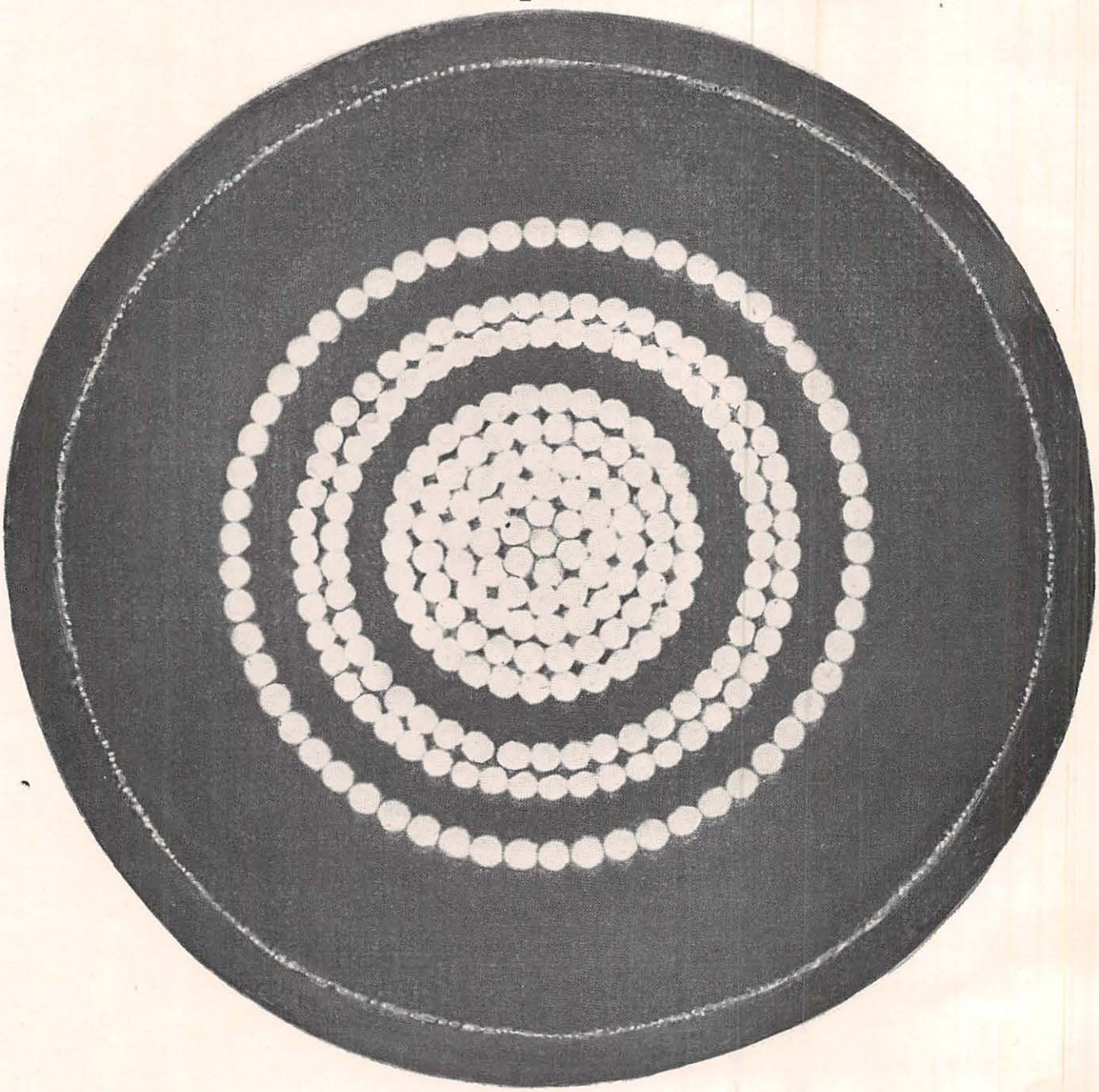

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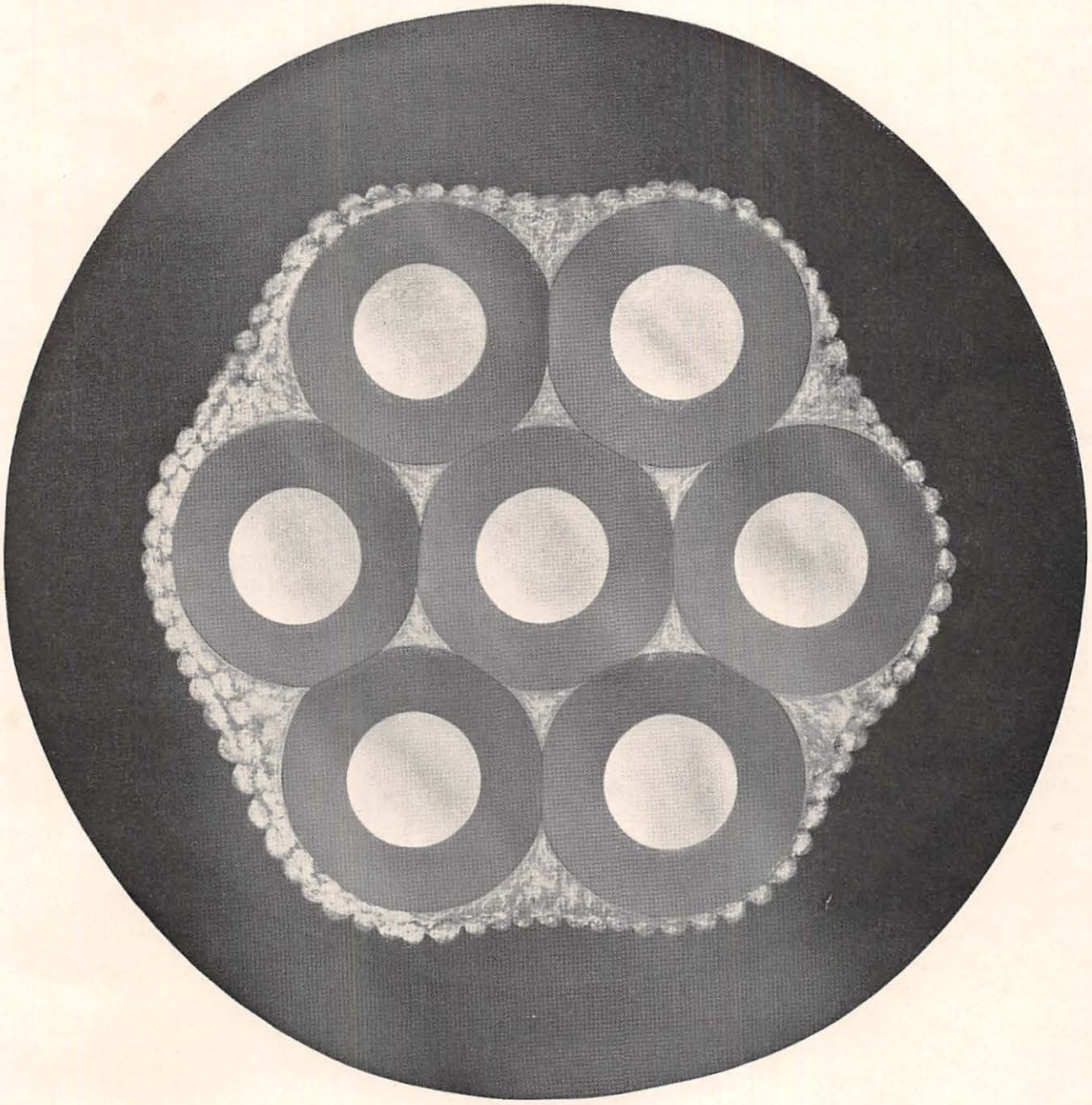

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RAILROADS INSTALLED AUTOMATIC PROTECTION AT OVER 1300 HIGHWAY CROSSINGS IN 1969

Railroad	Highway Grade Crossings protected by: Flashing-light Signals	Flashing-light Signals & Gates	Block Signals & Traffic Control: Road Miles	Switches	Electric Locks	Signals	Train Stops Cab Signals	Interlockings: No. of Plants	Power Switches	Signals
Alaska	5	—	—	—	—	—	—	—	—	—
A&StAB	1	—	—	—	—	—	—	—	—	—
A&WP	—	1	—	—	—	—	—	—	—	—
Georgia	—	1	—	—	—	—	—	—	—	—
WRyA	—	—	69(ABS)	—	—	69	—	—	—	—
BAR	2	—	—	—	—	—	—	—	—	—
B&LE	4	—	—	—	—	—	—	—	—	—
B&M	5	—	9	—	5	5	—	1	3	6
Burlington	48	8	—	1	—	2	—	1	1	—
CN	169	25	58	26	21	78	—	3	10	22
CP Rail	96	10	28	6	2	29	—	—	—	—
C&O/B&O	45	18	22	6	12	28	—	—	—	—
C&NW	50	9	—	—	—	—	—	—	—	—
C&WI	—	1	—	—	—	—	—	—	—	—
CTA	—	—	13(ABS)	—	—	—	70cs	3	25	32
Cleveland TS	—	—	—	—	—	—	—	2	4	2
D&H	6	—	—	—	—	—	—	1	6	6
DT&I	2	3	16	4	3	4	—	5	4	10
DM&IR	—	—	8	2	—	7	—	—	—	—
EJ&E	1	2	5	—	—	2	—	—	—	—
EL	4	10	—	—	—	—	—	3	7	11
FEC	6	12	4	1	13	2	—	—	—	—
Frisco	19	1	—	—	10	—	—	—	—	—
GN	12	8	51	13	11	79	—	—	—	—
GB&W	4	—	—	—	—	—	—	—	—	—
GM&O	7	1	11	1	4	9	—	1	—	4
IC	30	12	69	13	18	82	—	1	—	6
KCT	—	—	—	—	—	—	—	1	—	—
L&HR	1	—	—	—	—	—	—	—	—	—
LV	7	1	19	1	7	17	—	2	11	22
L&N	20	5	—	—	—	—	—	—	—	—
MEC	5	—	—	—	—	—	—	—	—	—
MTA-LI	—	11	—	—	3	—	—	—	—	—
NYCTA	—	—	4	—	—	30	78ts	3	43	31
Milwaukee Road	25	4	—	—	—	—	—	2	6	—
M-K-T	11	1	—	—	—	—	—	—	—	—
MP	22	3	—	—	—	—	—	—	—	—
T&P	6	1	—	—	—	—	—	—	—	—
Monon	3	—	—	—	—	—	—	—	—	—
Montreal, CdeT	1	1	15	—	—	—	—	—	—	—
N&W	17	13	47	17	11	54	—	5	7	18
NP	9	4	179(ABS)	—	—	143	—	1	10	11
NS	4	—	—	—	—	—	—	—	—	—
PGE	8	—	—	—	—	—	—	—	—	—
PC	70	47	217	45	10	124	4cs	4	24	7
PATH	—	—	—	—	—	12	12ts	—	—	—
Reading	2	—	1	—	1	2	—	2	2	1
Rock Island	26	11	—	—	1	—	—	1	1	—
Santa Fe	50	70	29	—	—	—	—	—	—	—
SCL	26	16	—	8	14	43	—	1	—	2
Soo Line	20	—	60	10	8	45	—	—	—	—
Southern	20	10	7	6	35	15	—	1	—	8
SP	17	160	—	—	—	—	—	—	—	—
TRRAStL	—	1	—	—	—	—	—	—	—	—
TP&W	2	—	—	—	—	—	—	—	—	—
UP	16	9	—	—	—	—	27cs	1	25	19
WM	2	—	—	—	—	—	—	—	—	—
WP	5	17	—	—	—	—	—	—	—	—
TS	2	—	—	—	—	—	—	—	—	—
Totals	913	504	941	160	189	881	101cs 90ts	45	189	218

RAILROADS INSTALLED OVER 450 DETECTORS DURING 1969

Railroad	Detectors					Feet of Slide Fence	Spring Switches	Electric Switch Lamps	Switch Heaters	Miscellaneous Signal Units*
	Broken-Loose Wheel	Clearance	Dragging Equipment	Hotbox	Presence					
A&WP	—	—	—	—	—	—	—	—	—	—
Georgia	—	—	—	—	—	—	—	—	—	5
WRyA	—	—	—	—	—	—	—	—	—	4
B&LE	—	—	—	—	—	—	—	10	5	—
B&M	—	—	—	—	—	—	—	—	6	1
Burlington	—	—	—	3	—	—	3	—	—	55
CN	—	1	46	49	—	—	1	—	111	2
CP Rail	—	—	—	1	—	2,500	—	—	90	—
C&O/B&O	—	—	5	—	—	500	—	—	—	—
C&NW	—	—	—	6	—	—	—	—	15	4
C&WI	—	—	—	—	—	—	—	—	6	—
CTA	—	—	—	—	—	—	3	—	100	18
D&H	—	2	—	—	—	—	—	—	—	1
DT&I	—	—	—	—	—	—	—	—	3	—
DM&IR	—	—	—	—	—	—	2	—	3	—
EL	—	—	—	—	—	—	—	—	8	—
FEC	1	1	9	9	—	—	—	—	—	—
Frisco	—	—	11	13	—	—	—	—	—	4
GN	—	—	7	6	—	700	—	—	5	—
GM&O	2	—	2	2	—	—	—	—	5	—
IC	7	—	10	7	—	—	1	—	13	—
KCT	—	—	—	—	—	—	—	—	25	1
LV	—	—	—	—	—	—	—	—	1	1
L&N	—	2	2	—	—	—	—	—	—	14
MTA-NYCTA	—	—	—	—	—	—	—	—	58	—
Milwaukee Road	—	—	—	—	—	—	1	—	—	3
M-K-T	—	—	19	12	—	—	—	—	—	—
MP	—	—	—	—	—	2,500	—	—	8	—
C&EI	—	—	—	—	—	—	—	29	—	—
T&P	—	—	—	—	—	—	—	—	—	6
Monon	—	—	—	—	—	—	—	—	—	6
Montreal, CdeT	—	—	—	—	—	—	1	—	—	—
N&W	23	—	37	21	—	—	—	—	31	—
NP	—	—	—	—	—	—	—	156	—	3
PC	—	3	1	1	93	—	—	—	—	128
Rock Island	—	—	—	—	—	—	8	—	—	—
Santa Fe	—	—	—	5	—	—	—	—	—	—
SCL	—	—	12	12	—	—	2	—	8	—
Southern	—	—	3	—	—	—	—	44	—	3
SP	—	—	—	4	—	—	9	—	4	—
SP&S	—	—	—	—	—	—	1	—	—	—
UP	—	—	—	9	—	1,012	—	—	—	—
WM	1	—	1	1	—	—	—	—	—	—
WP	—	—	—	2	—	—	—	—	—	2
Totals	34	9	165	168	93	7,212	32	239	505	261

* Includes retarders and power switches in yards, electric locks in interlockings, etc.

C&S units installed drop in '69 from 1968

Microwave, safety detectors and intercom systems show gains.

1969 was a mixed year for signal and communications installations. For many, it was the year of completing projects and planning for new ones. On balance, railroads installed 11% fewer units of signal equipment than they did in 1968. For communications, the drop was a more modest 4.5% in units of equipment installed by U.S. and Canadian railroads and transit authorities.

Roads had actually budgeted a modest 4% increase for signal projects, but the fall off of installations can partially be charged to union wage demands that were in negotiations when the '69 budgets were prepared. Union demands agreed to in April wipe out some projects. On the communications side, roads had budgeted about 17% fewer dollars. But the drop in installations was even more mild, amounting to 4.5% fewer units compared to 1968 installations.

Bright spots included automatic car identification, with roads installing 30 ACI scanners during 1969. While most were installed for test purposes (see Missouri Pacific experience described on pages 32-37 this issue), some were installed for immediate operational improvements. For example, Duluth, Missabe & Iron Range replaced older ACI scanners with new units employing solid-state equipment with integrated circuits. Chicago Transit Authority installed a scanner to detect new Dan Ryan transit line trains and to initiate action operating a junction switch for correct routing of these trains.

Increases were experienced in the number of microwave stations installed, number of telephones and loudspeakers installed for intercommunications purposes, and the number of safety detectors placed in service in 1969. Although the category of printing telegraph machines installed showed a decline from 1968, a new category of computer input/output devices was provided to show other types of I/O units installed by railroads.

For the so-called "bread and butter" items such as centralized traffic control, interlockings and highway crossing protection, it was a year of frustration for many signal engineers in trying to have enough men to install the equipment. On some roads, the manpower shortage, especially of skilled men, slowed installation rates. The solution of many roads is planning for and beginning training programs for the unskilled and semi-skilled men in their signal departments.

On the communications and computer side, it was not so much a case of not having enough men to install equipment, as it was one of making use of the expanded communications facilities. Most communications officers have been able to keep ahead of their roads' computer requirements. Hence, 1969 was a year of implementing computer capability in the field of teleprocessing, including message switching.

On Illinois Central, data processing and computer programming activities in 1969 were centered on refining the railroad's use of its computer capability and developing new applications, including establishment of programming and computer system support for such programs as car distribution and control, responsibility accounting and freight claim activities. The IBM 360/50 computer was replaced by a 360/65 for increased capability.

Santa Fe acquired a second IBM 360/65 and upgraded the present model 65 to provide a duplexed teleprocessing configuration. AT&SF began implementation of system-wide data collection and administrative message switching involving 523 terminals and 240 circuits. Early in the year, car location inquiry directly to the computer was made available to shippers. A pilot project of regional computer-supported car distribution centers was successfully undertaken.

Soo Line went real-time during 1969 on its car location and car inventory information system. Records of train, car and locomotive movements are carried in third-generation computers. Visual display consoles in several Minneapolis headquarters offices provide ready access to current data. Off-line traffic offices were scheduled to be connected to this system by the end of 1969.

Illinois Central and Northern Pacific saw their system-wide microwave networks operational in 1969.

Burlington, Northern Pacific, Penn Central and Santa Fe, for example, were hard at work completing the construction of new and upgrading of older automatic classification yards. Others, such as Canadian Pacific and Texas & Pacific will provide ACI systems as key units to the computer-operated yard control systems.

1969, while not a great year for new equipment installations was a good year for replacing old units with new and modernized equipment. Several roads replaced vacuum-tube radio units with new solid-state sets. Information in the tables on pages 24-25 and 28-29 includes replacements as well as new installations.

Although 1969 fell short of last January's predictions, it was still a respectable year, and one that kept signal, communications and control engineers very busy. Time not spent on new installations was utilized in planning for 1970 and the decade ahead.

COMMUNICATIONS EQUIPMENT INSTALLED 1965-1969

	1965	1966	1967	1968	1969
Miles of new or rebuilt pole line*	2,939	2,385	2,152	2,521	3,051
Miles of aluminum wire or cable installed*	1,438	2,833	2,606	1,509	1,252
Miles of copper wire or cable installed*	1,398	1,545	1,653	1,313	1,755
Carrier equipment installed					
Terminals and repeaters					
Voice only	3,157	1,822	2,536	2,771	1,884
Speech plus data	82	106	142	2,402	632
Data only	2,553	2,750	2,727	2,097	2,274
Microwave stations	191	85	79	102	186
Printing Telegraph Machines	2,543	4,470	2,770	2,542	5,176
Computer Input/Output Devices	—	—	—	—	558
Data Modems	—	—	—	—	1,059
Automatic Telephone Exchanges	54	102	61	63	54
Stations available	6,988	5,718	5,841	7,032	3,962
Radio					
Mobile units	3,956	6,655	3,831	3,854	3,448
Fixed stations	500	813	424	427	513
Portable units	4,029	4,237	1,894	2,776	2,342
Intercom or Loudspeaker Systems	59	76	119	68	75
Loudspeakers	550	757	2,424	905	1,010
Telephones	98	96	538	132	848
Automatic Car Identification Scanners	3	2	4	3	30
Other Communications Units	—	—	—	—	210
Totals	24,763	27,689	23,386	25,174	24,261

*Excluded from totals

SIGNAL EQUIPMENT INSTALLED 1965-1969

	1965	1966	1967	1968	1969
Traffic control and block signal systems					
Track Miles*	1,929	1,496	1,662	1,350	1,072
Signals	1,821	1,518	1,998	1,452	881
Power switches	341	297	473	301	160
Electric locks	487	400	277	237	189
Automatic train stops	57	143	743	120	90
Rolling stock with train stops or cab signals	231	68	214	162	101
Classification yards	3	5	2	4	5
Retarders	53	55	26	25	17
Power switches	116	220	115	257	168
Highway crossings protected					
With flashing lights only	882	761	1,079	986	913
With flashing lights and gates	349	459	638	525	504
Interlockings	92	60	84	65	45
Power switches	335	257	174	211	189
Signals	683	417	380	317	218
Safety detectors					
Dragging equipment	19	123	70	144	165
Clearance (high-wide load)	3	3	3	15	9
Hotbox	133	221	132	157	168
Presence	212	212	210	—	93
Loose or broken wheel	31	31	31	48	34
Slide fence feet*	22,553	10,424	116,700	18,351	7,212
Other signal devices	736	344	393	367	847
Totals	6,584	5,594	7,042	5,420	4,796

*Excluded from totals

Missouri Pacific continues ACI test

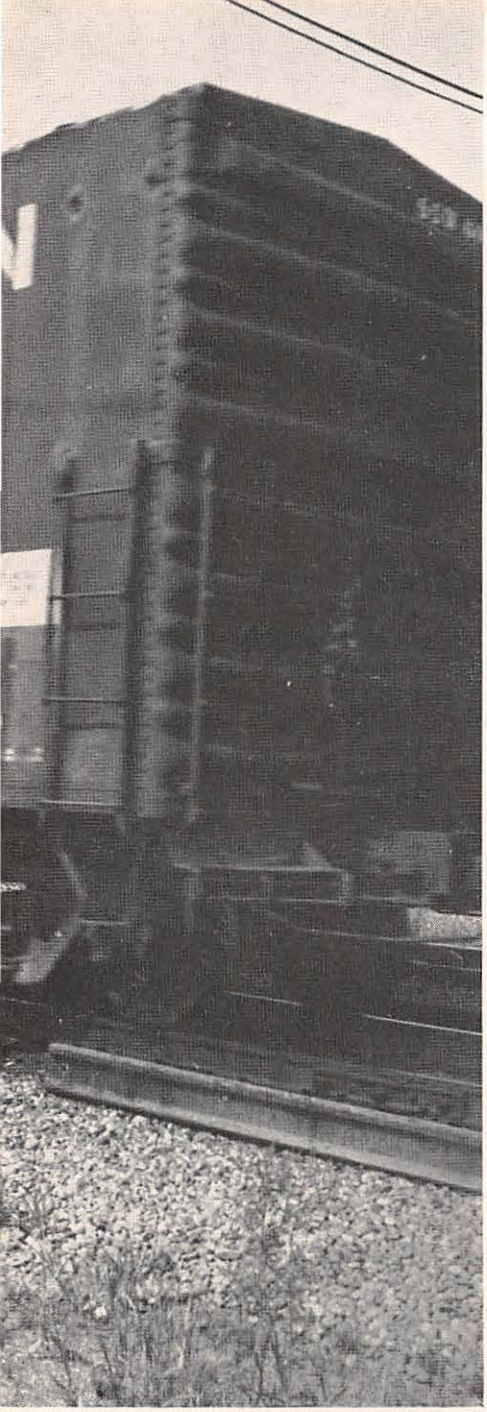
ABOUT 3,000 CARS DAILY pass mainline automatic car identification scanners located

Since July 1969, five automatic car identification scanners have been reading passing freight cars on Missouri Pacific lines at Dupo, Ill. Two scanners are located north of MP's Dupo yard, one on each side of the double-track main line. An interchange track to the Terminal Railroad Association of St. Louis is also covered by another ACI scanner. South of Dupo yard, two more scanners provide coverage on the double-track MP mainline.

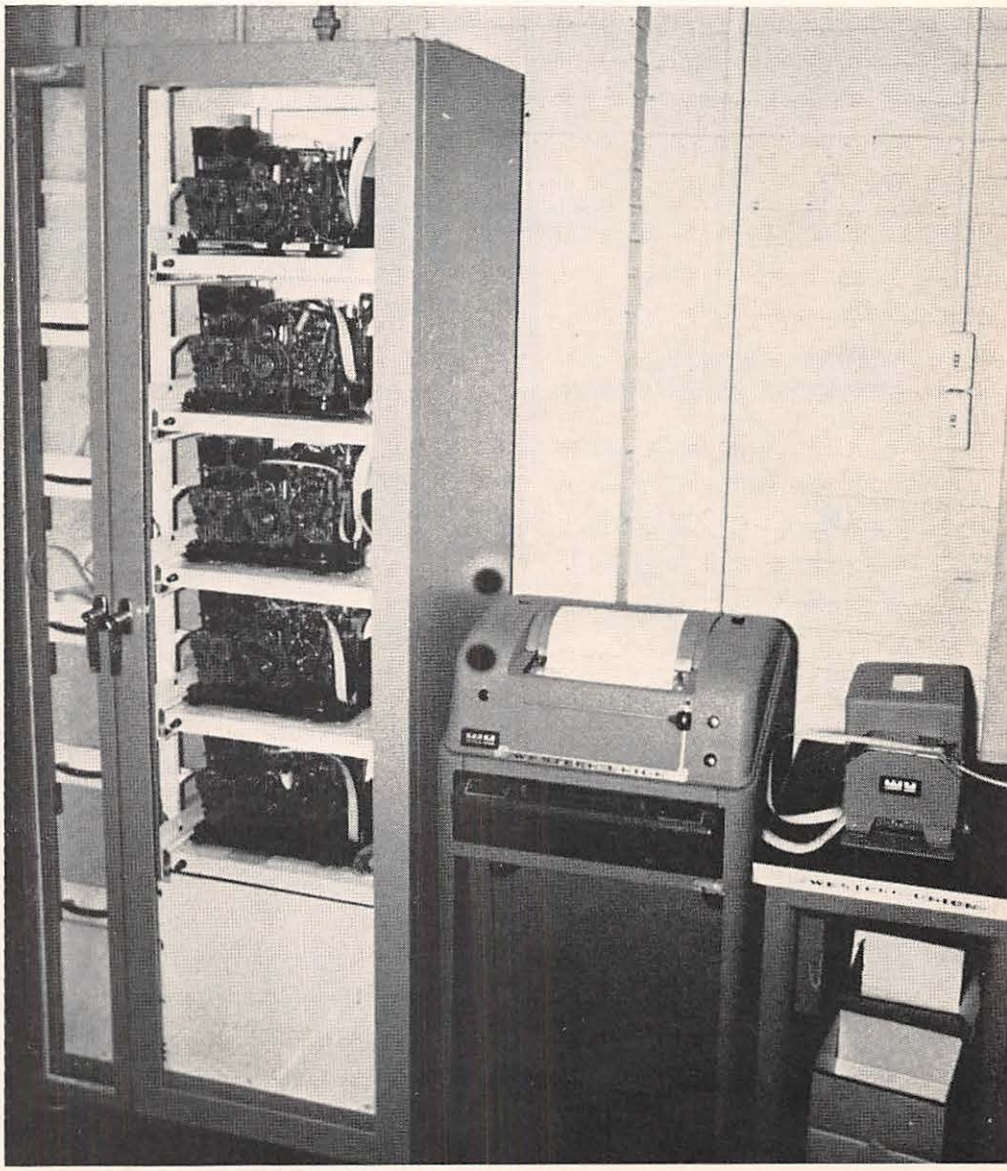
The Dupo yard area was chosen for implementation of ACI because it would provide (1) a high volume of rail traffic; (2) a terminal that could make good use of the ACI information on both a pilot basis and a permanent basis; (3) easy access for MP and manufacturers engineers and technicians; and (4) conditions reasonably typical of other MP terminals. Another advantage was that full coverage could be provided with a minimum number of scanners and auxiliary equipment.

Test results from an approximate one-month period showed satisfactory operation, but as might be expected, there were problems. In the test period, a total of 8,935 cars passed the scanners at Dupo. Of this number, 4,569 cars had labels. Accuracy reached 95.75% for the labelled cars read correctly. To compare ACI-generated data with the initials and numbers of passing cars, a manual check was made by an observer who recorded the initials and numbers of cars on sound tape. The presence of an ACI label was indicated on the recording by naming the colors of the validity check module. If a label was extremely dirty, improperly applied or mutilated that fact was also recorded. In some cases, inbound trains were located in the yard and individual cars examined to determine label condition.

Significance of the tests, according to James H. Seamon, senior industrial engineer, MP, are: "About 50% of the



at MP's Dupo, Ill. yard.



YARD OFFICE HAS MODEL 28 ROTR unit to receive ACI data on punched tape.

cars passing the scanner are labeled. Of the cars labeled, 95.75% were read correctly, and there was some variation in percentage from scanner to scanner. More than 1% of the labels (49 of 4,569) were bad, and almost another 1% (41 more) had an incorrect validity check module."

MP is continuing this testing operation of the ACI scanners at Dupo to obtain further experience with the equipment. One small by-product is the identification of cars with incorrect label modules. Approximately 3,000 cars daily pass the mainline scanners, while about 140 cars are moved daily through the MP-TRRA connecting

MANAGEMENT INFORMATION

Missouri Pacific installed five automatic car identification scanners at its Dupo, Ill. yard that provide coverage on the double-track mainline, plus an interchange track with the Terminal Railroad Association of St. Louis. During two test periods of several months when passing cars were manually checked against ACI data, over 16,000 cars were scanned. From the test period of August 21 through November 12, results indicated the following:

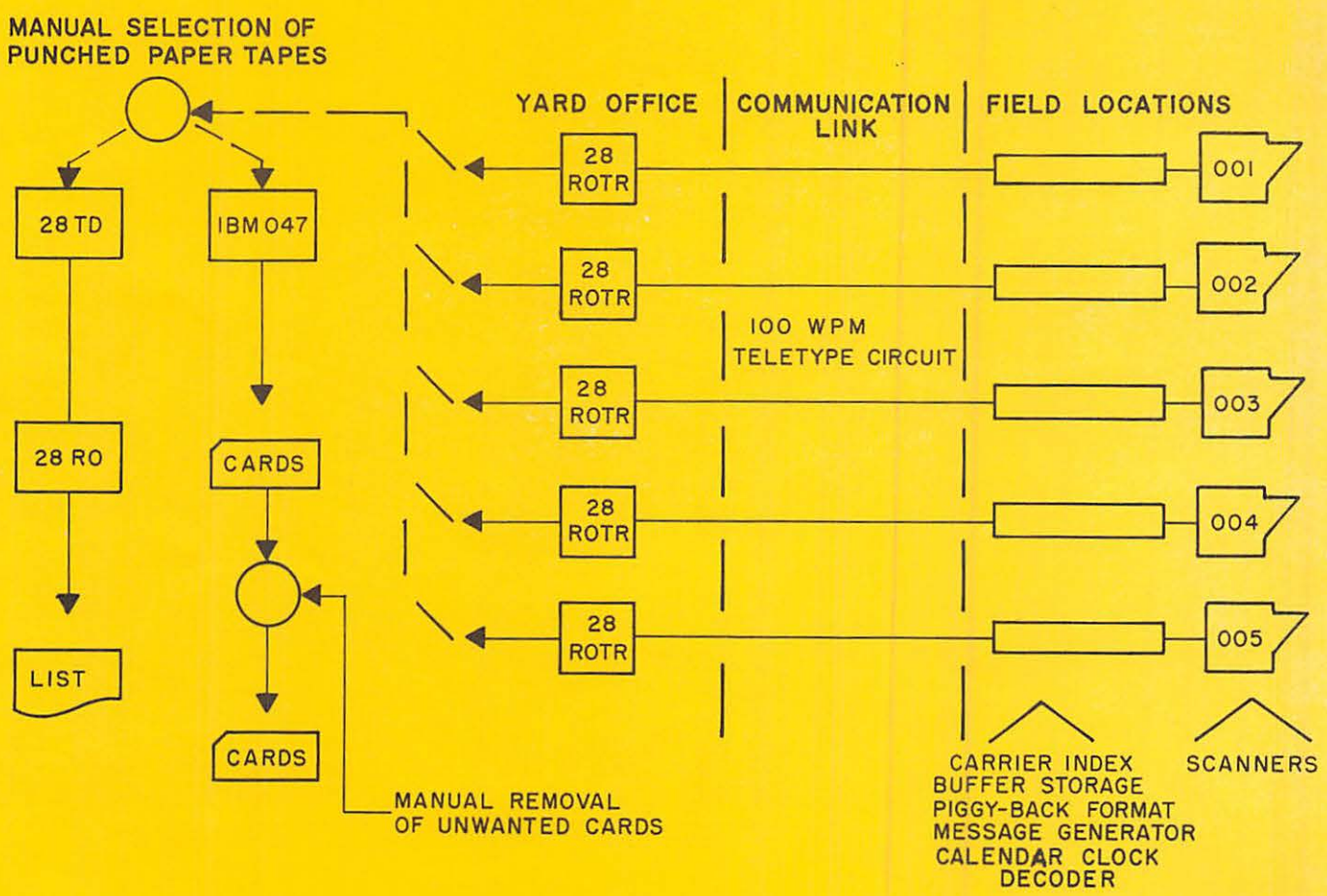
—About 65% of the cars passing the scanners in mid-November are labeled with valid labels.

—Percent of valid labels read ranged from 53 to 98. Bad labels were 1.33% of the total and 0.67% of the labels had incorrect validity modules.

—Some tests were made after dark and some in light rain. Results were comparable to those of day tests.

Of significance is that MP installed the Dupo ACI system as part of an overall plan to fit the railroad's information requirements. Experience gained at Dupo will be valuable in implementing system-wide requirements. Also, MP will continue to install ACI scanners at strategic points to improve operations, as well as to detect bad labels to permit routing cars to relabeling facilities.

DIRECT CIRCUITS LINK EACH ACI SCANNER WITH TAPE PUNCH IN YARD OFFICE

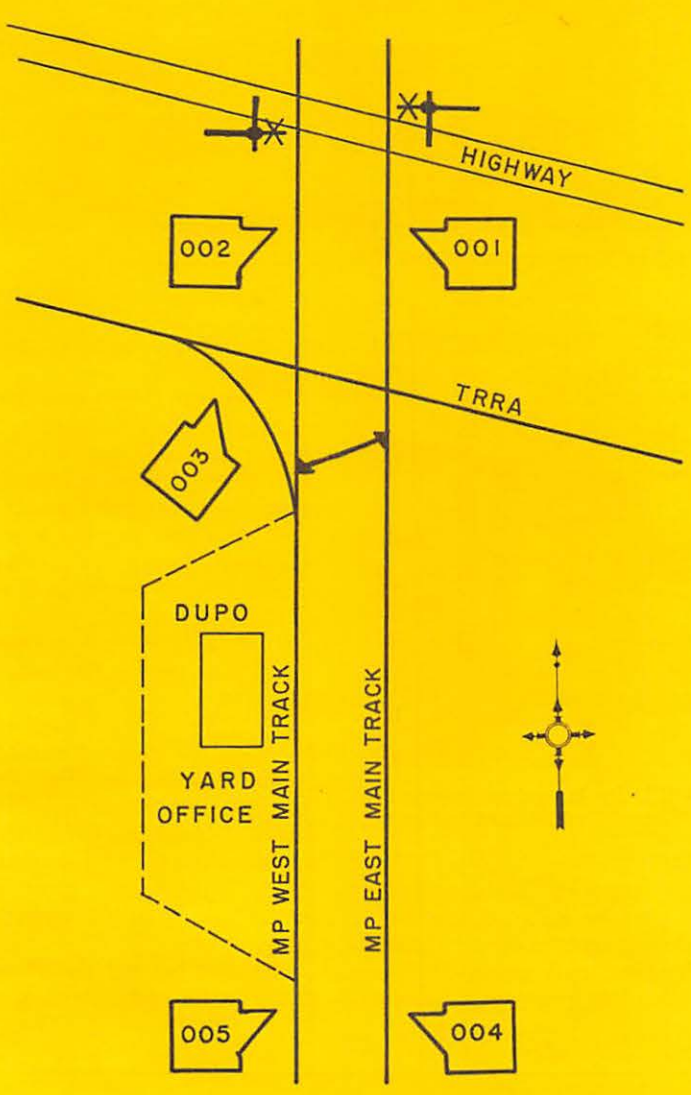


track. Traffic includes seven MP freight trains, two MP locals, one Missouri-Illinois freight train, and seven St. Louis Southwestern freight trains that operate via trackage rights over the MP mainline. Additionally, a unit coal train operates from an Illinois coal mine through Dupo to a Labadie, Mo., electric plant.

As part of the testing procedure, MP is able to obtain scans of both sides of a through train. The double-track mainline is in traffic control territory. This enables the dispatcher to run trains by one scanner, then cross them over to the other main track so that the scanner at the other end of the yard will scan the opposite side of the train. In one case of a through train, two adjacent cars were found to have interchanged labels on one side only. The labels were mounted on plates that had been tack-welded to the sides of the cars. "Apparently a carman worked down one side of the standing cars welding on labels, but when he worked back the other side he forgot to check to see that his labels were in the correct order," commented an MP carman.

Other label problems turned up by the MP included application at an angle causing the label either to be tilted sideways or to be tilted forward or backward. Labels are sometimes placed too low on rack cars causing the bottom of the label to be out of the depth of field of the scanners. Some labels have been multilated or damaged. MP suggests that labels be placed high on the car and away from the ladders making it difficult for people to reach them and inflict damage. MP

FIVE ACI SCANNERS CAPTURE TRAFFIC AT DUPO YARD



also found some labels with incorrect modules, so that the scanner correctly read false information. On some flat cars, labels were recessed underneath the wood decking. The scanner could not read the label.

MP has purchased the five ACI scanners from Sylvania Electric Products, Inc. Each Kar-Trak scanner is equipped with decoder equipment, buffer core storage for 500 labels, piggyback format control, message generator and calendar clock. The clock is battery operated, so that if the commercial power fails, the clock at each scanner will not have to be reset upon restoration of power. Carrier indexes are to be provided for each scanner, but these have not yet been delivered.

Transmission from each scanner site is via a 100-wpm leased teleprinter circuit into a Teletype 28 ROTR tape punch in the Dupo yard office. From these ROTRs, a clerk may place the punched tape into an IBM 047 unit to produce punched cards or into a Teletype model 28TD that feeds a receiving only page printer (28RO) to produce a hard copy list. At present, Dupo yard office has a PICL (perpetual inventory car location) system using punched cards that are automatically keypunched from advance Teletyped consists or manually from the inbound train check. Eventually, it is anticipated that the ACI-generated inbound train check will be fed directly to the 047 cardpunch unit to produce a deck of cards. Yard clerks would then keypunch the spot number before filing the card in the PICL system.

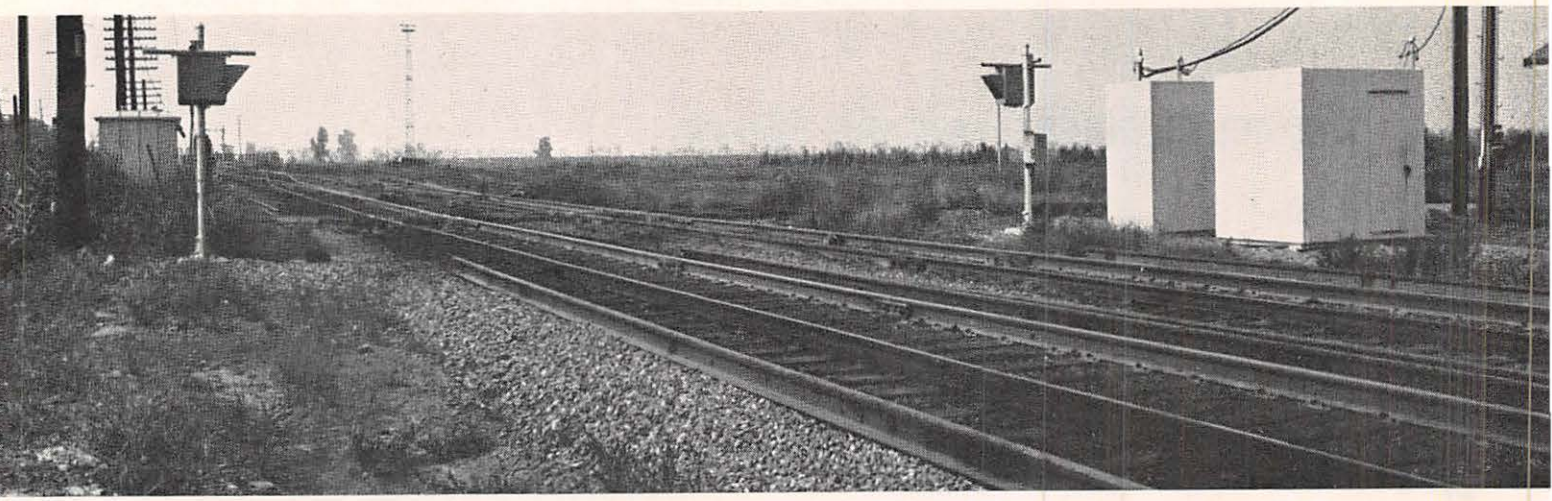
At the scanner locations, decoding units and associated equipment for two scanners are located in fiberglass bungalows, equipped with air conditioning. Also in the bungalow, is an MP communications department developed test panel with jacks for measuring line and equipment currents, and a jack is provided for connecting a Teletype machine for test purposes at the bungalow.

The pole-mounted ACI scanners are aligned so that the scanning light beam strikes passing cars at 11 degrees off the right angle (90 degrees). "This provides more light reflecting from the retroreflective label to the scanner," says Arthur Apffel, customer engineer, Transportation Control Systems, Sylvania Information Systems.

To provide warm up time for the Xenon scanner lamp, about 15 seconds, MP uses Harmon Electronics AFTAC audio frequency track circuits at the mainline scanner locations. Welded rail recently laid on the mainline made the use of audio frequency track circuits desireable because they do not require the use of insulated joints. At the north end of Dupo yard, a highway crosses the railroad, and the crossing approach stick circuits are used to turn on the ACI scanners. Because this is double-direction running territory, with a maximum speed of 50 mph, crossing approach stick circuits are used for both directions on both tracks. For northbound trains, the ACI equipment is turned on when trains are 1,300 ft from the scanners, and for southbound trains, the "turn-on" point is 2,200 ft from the scanners.

For the ACI scanner on the TRRA connection, where speed is limited to 10 mph, style C track circuits are used to provide 200 ft turn-on circuits in each direction.

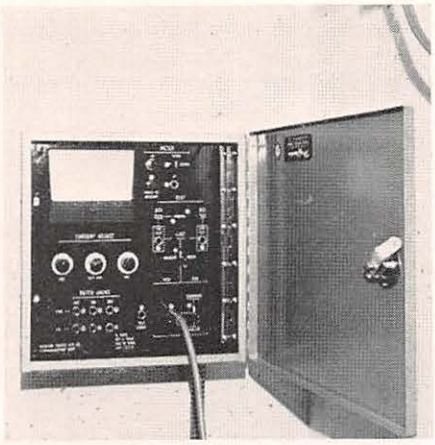
At the south end of Dupo yard, AFTAC audio frequency track circuits were installed on the main tracks which are designated East track and West track. The circuits for northward



DECODERS AND ELECTRONIC CONTROLS are located in fibreglass bungalows that are air conditioned.

trains on both main tracks are 2200 ft in length, and the circuits for southward trains are 1650 ft long on the east track and 1400 ft long on the west track. In operation, shunting of track circuit in approach to a scanner turns the unit on. Shunting of the next (or second) circuit provides directional information for the message generator. Label information is stored on a 500-label core buffer. When train moves off the second track circuit action is initiated for transmitting the ACI data to the Teletype receiving reperforator in the Dupo yard office.

This Dupo ACI installation was designed and carried out as part of MP's general plan for the implementation of ACI. A preliminary study was made by a senior research assistant in conjunction with general managers and district staff personnel. A further refinement was made by a committee consisting of an industrial engineer, a signal and communications engineer and a management information division project leader. In the pilot installation at Dupo, Ill., six departments cooperated: operating, signaling and communications, systems and data processing, purchasing, industrial engineering and engineering.



TEST PANEL in bungalow is used to measure line and equipment currents.

In general, MP plans to install 34 scanners at seven major terminals. Scanners at terminals can provide more accurate interchange information in the interest of minimizing car tracking. Also, ACI can provide more accurate road-train consist information in the interest of early detection of no-bill cars and of better records.

Guide lines were developed for ACI installations on the MP and include the following:

—ACI installations must be compatible with the planned management information system on a long-term basis.

—ACI installations must be compatible with yard mechanization and terminal car control on a short-term basis.

—ACI installations must be justified on the basis of cost, accuracy and reliability.

Planning beyond the Dupo installation is continuing with work centered in

TRACK CIRCUITS TURN ON LAMP IN ACI SCANNER BEFORE TRAIN PASSES

Scanner	Northbound Start	Southbound Start	Northbound AFTAC Audio Frequency Overlay	Northbound AFTAC Single Tone Modulation	Southbound AFTAC Audio Frequency Overlay	Southbound AFTAC Single Tone Modulation
001	1,300 ft	2,200 ft	1.1 kHz	10 Hz	1.6 kHz	16 Hz
002	1,300 ft	2,200 ft	1.3 kHz	10 Hz	1.9 kHz	24 Hz
003	200 ft	200 ft	Style C track circuits (AC from center down to end, through rectifier, then DC back to scanner location at center)			
004	2,200 ft	1,650 ft	1.1 kHz	10 Hz	0.7 kHz	24 Hz
005	2,200 ft	1,400 ft	1.3 kHz	10 Hz	0.9 kHz	10 Hz

the industrial engineering department. Planning, says Seamon, is proceeding along these lines:

"Development of an ACI timetable of proposed installations through mid-1972.

"Selection of additional major terminals for installation of ACI systems on a 'stand-alone' basis not involving teleprocessing.

"Investigation of the problem of selective scanning, selective transmission and selective output. (Involves rejecting unwanted data on doubling, switching, etc.)

"Investigation of a joint facilities approach to ACI.

"Investigation of lease vs. purchase for ACI and of contract vs. railroad maintenance for the equipment.

"Development of an ACI system integrating scanners with a process control digital computer. (This digital computer is to be installed as part of the upgrading of a hump yard. It will handle the humping and monitoring of cars as its primary function.)

"Investigation of the problems of integrating ACI into the management information system being planned for the entire railroad," says ACI coordinator Seamon.

Missouri Pacific testing of ACI covered the periods of July 28 through August 20 and from August 21 through November 12. Extensive records were kept of the cars read, not read, labeled, not labeled, misread, valid labels, etc. Over 16,000 cars passed the ACI scanners during these test periods.

Significance of the test results were outlined in a second report issued by MP on Nov. 19, 1969. The report stated:

"(1) There are as yet far too many unlabeled cars to permit any general use of ACI as an information source.

"(2) After the car fleet has been completely labeled, some time will be required for correction of bad labels. The present figure of over 1% bad labels will greatly limit the usefulness of ACI.

"(3) The reliability of the scanners is not yet up to the level required for full utilization of ACI.

"(4) Labels on tank cars, covered hopper cars, and particularly on low cars are a definite problem and a solution must be found in order for ACI to be useful to MoPac. . . .

"(6) There is a need to install scanners at strategic points to detect bad labels and permit routing those cars to re-labeling facilities.

"Recommendation: The MoPac should continue testing at Dupo. Plans should be made to install additional scanners at strategic points to permit detection and correction of bad labels. These scanners should be installed by the time the car fleet is 90% labeled."

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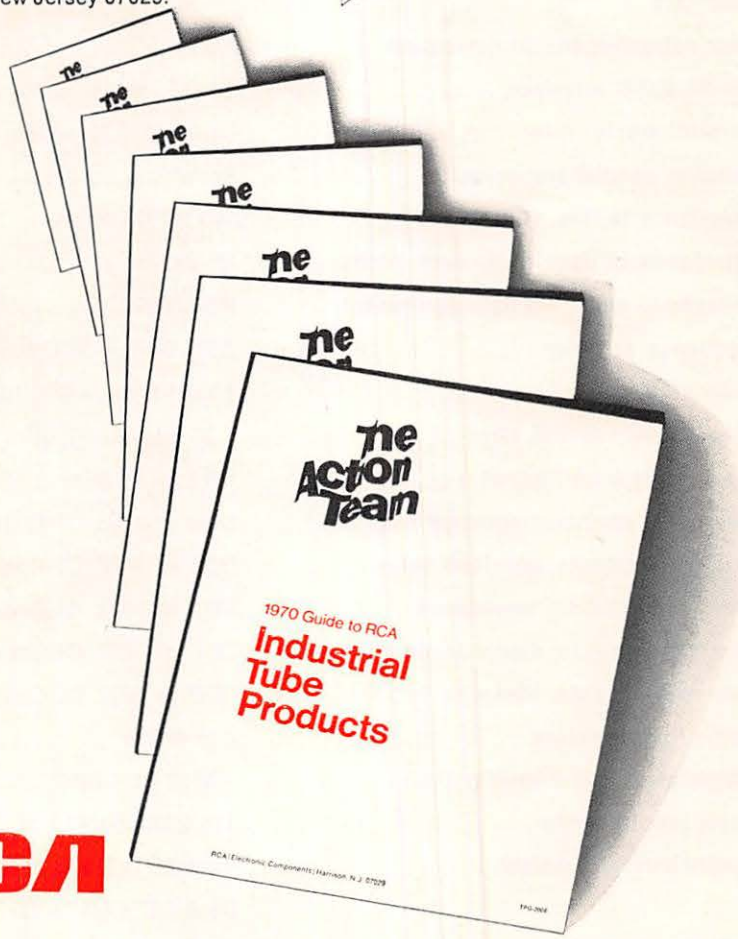
The Action Team



RCA

Circle 14 on reader service card

Data Sheet 184

DATA MODEM CHARACTERISTICS

Manufacturer	RFL Industries, Inc.	RFL Industries, Inc.
Model	22 DB/EIA	13 AO/TTY & 13 AA/TTY
Transmit and/or receive	Transmit & Receive	Transmit & Receive
Full and/or Half Duplex	Full On 4W; Half On 2W	Full Duplex
Dial up or Private Line Application	Dial Up or Private Line	Dial Up or Private Line
Turn around time (HDX)	As Low As 15 ms.	—
Automatic answer capability	Yes	Yes
Type modulation	Asynchronous FSK	Asynchronous FSK
Operating Frequencies	1700 ±500 Hz	1170 ±100 Hz & 2125 ±100 Hz
Clock, internal or external	External	External
Loop back testing feature	Yes	Yes
Error rate	—	—
Error detection and/or correction	None	None
EIA RS-232-B interface	Yes	Yes
Bit or character rate	Up to 1200 Bits/Sec.	Up to 300 Bits/Sec
Serial or parallel transmission	Serial	Serial
Impedance to line, ohms	600 to 900 ohms	600 to 900 ohms
Impedance to data equipment, ohms	RS-232-B	TTY (Contact & 20 mA)
Voltages to and from data equipment	RS-232-B	12 Volts
Frequency stability	2.5% from −30°C to +70°C	2.0% from —30°C to +70°C
Level stability	1.5 dB from −30°C to +70°C	65 dB from −30°C to +70°C
Output levels to line, dbm	−30 dBm to +2 dBm	−30 dBm to +2 dBm
Input levels from line, dbm	+6 to −45 dBm	+6 to −40 dBm
Line requirements, frequency response	DDD or 3002, C1 Cond.	DDD or Voice Grade
Line requirements, envelope delay	DDD or 3002, C1 Cond.	DDD or Voice Grade
Line requirements, impedance	DDD or 3002, C1 Cond.	DDD or Voice Grade
Line requirements, signal to steady noise	DDD or 3002, C1 Cond.	DDD or Voice Grade
Line requirements, signal to impulse noise	DDD or 3002, C1 Cond.	DDD or Voice Grade
Method of operation	2 or 4Wire	2 or 4Wire
Temperature and humidity limits	−30°C to +70°C	−30°C to +70°C
Power requirements	115/230V, 50/60 Hz, 25W	115V, 50/60 Hz, 12W
Dimensions and weight	Rack 19" x 3½" x 8" Approx.	Approx. 10 lbs
	Desk 18" x 4¾" x 9⅞" 20 lbs.	12" x 4" x 5"
Digital or analog	Digital	Digital

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Circle 15 on reader service card

People

BESSEMER & LAKE ERIE: **Francis S. Hoist** appointed senior engineer- operations research, Pittsburgh.

CANADIAN NATIONAL: **J. E. Skinner,** regional research officer, appointed manager, management services with headquarters at Winnipeg, Man.

CHESAPEAKE & OHIO/BALTIMORE & OHIO: R. E. Wilt appointed communications inspector at Huntington, W. Va. **L. B. Michael, Jr.,** appointed supervisor communications services at Baltimore, Md. **J. A. Darling** appointed industrial engineer at Baltimore. **Bobby G. Small,** senior circuit engineer signals, appointed leading circuit engineer signals. **Ronald A. Brown,** circuit engineer signals, appointed senior circuit engineer signals. **Charles E. Watson,** junior circuit engineer signals, appointed circuit engineer signals. **James C. Elkins,** signal application engineer, appointed junior circuit engineer signals. **Thomas L. Burke** appointed signal application engineer. **Gary J. Bowerman,** junior circuit engineer signals, appointed circuit engineer signals. **Jon A. King,** signal application engineer, appointed junior circuit engineer signals. **William F. Ramsdell II** appointed signal application engineer. **Benjamin B. Cyrus,** junior circuit engineer signals, appointed senior circuit engineer signals. **Carl L. Horne,** signal application engineer, appointed junior circuit engineer signals. **James E. Zornes,** signal draftsman, appointed signal application engineer. **Hubert F. Cummings,** engineer signal estimates, appointed senior engineer signal estimates. **John L. Marsh, Jr.,** circuit engineer signals, appointed engineer signal estimates. **James R. Winter,** junior circuit engineer, appointed circuit engineer signals. **Clarence J. Nicely,** signal application engineer, appointed junior circuit engineer signals. **Andrew J. Toney, Jr.,** assistant signal maintainer, appointed signal application engineer. **Hugh L. De Moss,** signal application engineer, appointed junior circuit engineer signals. **Ritchie A. Blevins** appointed signal application engineer. **Frank T. Branham,** signal maintainer, appointed signal application engineer. **Robert T. Johnson,** assistant signalman, appointed signal application engineer. **Milton E. LaCoss,** assistant signal supervisor, appointed circuit engineer signals. **Clarence P. Howard, Jr.,** appointed signal application engineer. **Paul D. Finnell,** district signal maintainer, appointed junior circuit engineer signals. All the above signal positions are at Huntington, W. Va. **Nary D. More,** signal maintainer, appointed assistant signal supervisor at N. Vernon, Ind. **Rusling D. Blackburn,** assistant industrial engineer, appointed industrial engineer at Baltimore, Md.

CHICAGO & NORTH WESTERN: **W. B. Ellis,** general superintendent-motive power, appointed assistant vice-president and director of industrial engineering.

CLEVELAND TRANSIT SYSTEM: **Robert T. Pollock** appointed general manager and chief executive officer, succeeding **E. C. Krueger,** resigned.

ELGIN, JOLIET & EASTERN: **Robert P. Vellines, Jr.,** appointed signal office engineer.

FRISCO: C. A. Peebles, assistant chief engineer, appointed assistant chief engineer- control, at Springfield, Mo.

GREAT NORTHERN: **Dale A. Meisch,** supervisor data communications, appointed engineering assistant. **M. L. Delaware,** supervisor communications, Great Falls, Mont., transferred to Grand Forks, N.D. **Wayne Haupt,** supervisor communications at Grand Forks, N.D., transferred to Minot. **L. E. Johnson,** engineering assistant at St. Paul, Minn., appointed supervisor communications at Grand Forks, N.D. **Edward R. Kelley,** field supervisor data control at Great Falls transferred to Minneapolis, Minn. **James Williams,** corporate management trainee appointed industrial engineer. **A. P. Tronsent,** staff assistant at St. Paul appointed assistant industrial engineer.

ILLINOIS CENTRAL: **Arthur K. McKechnie,** director of systems and programming, appointed assistant vice-president computer systems.

LOUISVILLE & NASHVILLE: **W. E. Anderson,** director data control, appointed director transportation planning and procedures at Louisville. **E. E. Clemons,** supervisor data control, appointed director data control.

MISSOURI PACIFIC: Curtis A. **Boyd,** superintendent Kansas City terminal, appointed assistant manager data control at St. Louis. **P. L. Broussard** appointed district coordinator management information division- installations at Houston, Tex. **T. G. Duvall** appointed district coordinator management information division- installations at Dolton, Ill. **H. E. McMillan** appointed district coordinator management information division- installations at North Little Rock, Ark. **P. L. Tucker** appointed district coordinator management information division- installations at Fort Worth.

NORFOLK & WESTERN: **Gerald P. Dolin,** area supervisor management information input, Columbus, Ohio, appointed manager- management information input at Roanoke, Va., succeeding **Harold R. Nelson,** retired.

PENN CENTRAL: **J. M. Finch** appointed regional industrial engineer, New Haven, Conn. **E. G. Barske** appointed senior industrial engineer. **H. L. Miller** and **D. J. McMahon** appointed industrial engineers. **Donald G. Shiels,** regional engineer communications and signals, Philadelphia, Pa. transferred to Cleveland, Ohio, succeeding **Arthur N. Rondeau,** resigned.

READING: **J. J. Foster,** manager signals, electrical and communications, appointed chief signals, electrical and communications officer.

SANTA FE: **Ray H. Adams,** assistant to vice-president operations, Chicago, appointed general manager at Los Angeles, succeeding **John N. Landreth,** retired. **Donald G. Ruegg,** assistant to vice-president information systems, Topeka, appointed assistant to vice-president operations at Chicago. **F. N. Senn,** assistant engineer communications, appointed construction engineer communications, Topeka, succeeding **Foster R. Moore,** retired.

Obituaries

WALTER O. HAHNE, eastern sales manager, New York for Exide Power Systems division of ESB Inc., died recently.

GEORGE C. SCHINDLER, retired assistant signal engineer, Chicago & North Western, died recently.

Our new rail-mounted SERVOSAFE® Hot Box Detective™ prevents axle burn-offs and derailments.

It's a good thing to have on your railroad.

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Do you have long stretches of track without SERVO**SAFE protection**?

Recent studies have revealed that such factors **as heavier** car loadings, faster train speeds and greater accelerations **have** combined to increase the incidence of overheated journal boxes. **This** has prompted many railroads to review their spacing of hot box detectors. Up to now, the average spacing has been 25 to 30 miles apart along line-of-road. Under today's conditions, however, a hot box can develop in less than 25 miles and cause a derailment *between* detectors.

One solution becomes self-evident: closer spacing of hot box detectors for more protection. A SERVOSAFE system will not prevent a hot box—but it will detect, locate and warn of a hot box before the condition worsens into a dangerous, costly axle burn-off and derailment!

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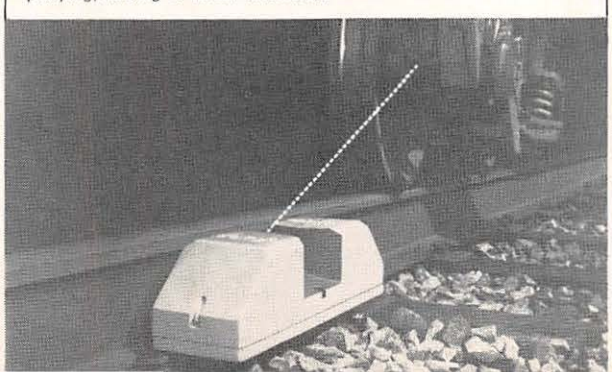
Our new Model 8808 SERVOSAFE system features patented rail-mounted scanners and solid state electronic data processing for the fastest, most precise detection of hot boxes. It allows remedial action to be taken *before* a failure occurs, and helps cut down the high costs of major salvage or replacement. The cost of installation and maintenance is appreciably reduced by eliminating the need for concrete foundations, special ties and expensive roadbed preparation. The rail-mounted scanner can be easily removed for maintenance or relocation. Finally, compare the cost of a SERVOSAFE with the $200,000 involved in just one derailment that could be prevented.

That's why most prudent, progressive railroad managements agree when we say, "More SERVOSAFE protection isn't costly—*lack of it is!*"

Model 8808 SERVOSAFE Hot Box Detective Rail-mounted scanner "looks" at journal bearing behind truck frame with a vertical, close-in target scan for greater uniformity and accuracy. Scanner is securely clamped to the rail (no drilling required). Accuracy is not affected by rail pumping, running or lateral movement.



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Circle 21 on reader service card

MEMBER RPI

News Briefs

Nine railroads plan to spend $40 million

Preliminary reports from nine railroads indicate that they will spend $39,758,535 during 1970 for installing new equipment and facilities in the areas of signaling, communications and controls.

Burlington will install remote control signaling at Carling Tower, at Lincoln, Neb. ($165,885).

Chesapeake & Ohio will install an electric interlocking at Cincinnati, Ohio junction to permit simultaneous moves ($638,000).

Detroit, Toledo & Ironton will install an electronic weigh-in-motion scale on the hump at Flat Rock Yard, near Dearborn, Mich. ($110,000).

Great Northern will construct a 2-mile CTC siding at New Irby, Wash.; replace master retarder at Gavin yard, Minot, N.D.; install hot journal detectors between New Rockford and Williston, N.D., and between Bainville and Shelby, Mont.; install CTC between Ephrata and Lamona, Wash., and between Marysville and South Bellingham, Wash; install CTC control machines, communication circuits and associated equipment for Transportation Control Center at Minot, N.D.; and replace manual operated tower with remote controlled interlocking at Soo crossing at Minot, N.D. ($2,789,000).

Long Island will install wayside radio communication system; make track and signal improvements at Huntington; install automatic flashing-light signals and gates at 35 railroad-highway grade crossings; and construct 38 additional substations in existing electrified territory ($31,830,000).

Northern Pacific will replace electro-mechanical interlocking with all-relay electric interlocking at Superior, Wis. and will replace semaphore signals with searchlight type signals and charging line between Berea and Jamestown, N.D. At Pasco, Wash., NP will upgrade the automatic classification yard including installation of a digital process control computer. At Laurel, Mont., NP will install a paging-intercom system and at Tacoma, Wash., an electronic weigh-in-motion scale will be installed. Also, NP will install 24 hotbox detectors, system-wide. Total costs estimated to be $3,565,150.

Penn Central plans to modernize Frontier yard at Buffalo, N.Y., and install automatic switching control for classification yard and automatic exit speed control on master retarder at West Detroit, Mich. ($355,000).

Reading plans to spend $109,000 to construct radio base stations on its system.

Western Pacific is planning an expenditure of $196,500 to provide microwave communication and data transmission system between San Francisco and Sacramento, Calif.

New firm offers service in data communications

General DataComm Industries of Norwalk, Conn., has been formed to provide engineering know-how and consulting services, as well as manufactured products in the area of data communications. Founder and president is **Charles P. Johnson,** former vice-president and general manager, Communications division of Litton Industries. **Donald R. Lehrman,** vice-president marketing, was a former marketing director of the Telecommunications division of ITT. According to Johnson, GDC will act as a communications consultant or undertake complete systems design. GDC builds and installs complete sub-systems that work with business machines, computers and data links.

Gould announces a new corporate organization

Gould Inc., is the new $343 million company resulting from the merger of Gould-National Batteries, Inc., and the Clevite Corp. Four new operating groups and their respective vice-presidents are: Batteries—**Richard B. Loynd;** Electronic Systems and Instruments—**Norman R. Klivans;** Power Components—**Walter L. Longnecker;** and Ordnance—**Thomas E. Lynch.** Among the operations in the battery group is the industrial battery division and the Nicad battery division. The electronic instruments and systems group includes the Brush instruments division.

Linear induction motor developed for vehicle

"The linear induction motor shows promise of replacing the wheel as the driving and braking mechanism for high speed ground vehicles," said Under Secretary of Transportation James H. Beggs, at a ceremony unveiling the high speed ground test vehicle in Los Angeles. The linear induction motor was developed by Garrett Corp., under contract to the office of High Speed Ground Transportation of DOT.

Beggs said the linear induction motor is "one of the technical advances which will enable us to combine both high speed and reliability in surface transportation by means of radically improved trains, tracked air cushion vehicles or vehicles not yet conceived.

"As the development of rocket propulsion enabled man to break loose from earth's gravity, so the LIM promises to enable us, on the ground, to be freed from dependence on the wheel," Beggs said.

The test vehicle powered by the linear induction motor is designed to operate at speeds up to 250 mph., The research vehicle is considered to be the first step in developing high speed ground transportation that will be in passenger service in the late 1970's and 1980's.

IBM sets up test center for teleprocessing

A new test center in Raleigh, N.C., has been set up by IBM Corp., for automatically testing terminals and control units for customer teleprocessing systems. Using data sets connected to the regular telephone network, IBM engineers dial the center, which in turn tests the customer's terminal and control equipment with a series of diagnostic signals. If the equipment is not operating properly, the IBM center informs the engineer by terminal printout of the probable location of the malfunction.

Infrared light serves as data transmission link

To connect computer terminals in the University of Colorado Engineering Research Center with the Computing Center, Dr. Jack R. Baird, of the Electrical Engineering department, developed an infrared light transmitter to span the 3,000 ft between the terminals and the computer. Assisted by EE seniors, Larry

Potter and Bill Stout, Dr. Baird constructed the communications system that has been operating over two months without maintenance. The basic transmitting element is a gallium arsenide infrared light emitter, and the basic receiving element is a photo transistor. Other key elements are 5-inch condensing lenses.

Atmospheric conditions are nearly no impediment, says Professor Baird, since rain and fog are translucent at the infrared wavelengths used. Heavy snowfall does block transmission, but otherwise the data link has proved so reliable that its downtime has been much less than that of the computer itself. Two more such light data links are being planned at the university.

Cleveland transit gets cab signal equipment

An additional 10 sets of high-frequency cab signal and speed control equipment will be installed on new transit cars supplied by Pullman-Standard. The controls, supplied by General Railway Signal Co., will be installed on new cars for the Hopkins International Airport line of the Cleveland Transit System.

National data network proposed to FCC

A proposal for a $375 million, 244-station microwave system covering 35 major metropolitan areas from Boston to San Francisco was submitted to the Federal Communications Commission Nov. 25, 1969 by the Data Transmission Co., a wholly-owned subsidiary of University Computing Co. According to *Telecommunications Reports,* it may be the largest single filing for new communications facilities in history. Datran spokesmen said the company does not plan to offer two-way telephone service, and that any voice service would be a necessary corollary to data service, such as the provision for voice answer-backs.

Engineering data "showed how customers would be served initially by a combination of 244 microwave repeater stations, 10 district offices for computerized switching, and tail circuits to customer locations." The tail circuits may be short lengths of cable facilities, either customer or Datran-owned, to microwave concentration points in the cities served. Individual customers could either own or lease their terminal equipment, or Datran will provide such equipment.

Datran will be seeking interconnection agreements with the communications common carriers. The initial system will run from Boston to Atlanta, Chicago, Minneapolis, Houston, Phoenix, Los Angeles and San Francisco with legs to Pittsburgh, Cleveland, Memphis and Des Moines.

The system "is designed to provide interconnection capability with either time division multiplex or analog modes of transmission. The applicant's policy will be to affirmatively seek interconnection with other carriers and other authorized communications entities in order to allow immediate service to all locations, and to augment the capability of the system to meet particular market service demands."

Basic rates would be $20 monthly for 150 bits/sec service, $25 for 4800 bits/sec, $30 for 9600 bits/sec, and $40 for 14,400 bits/sec service, each as rate floors including respectively, 4000, 5000, 6000 and 8000 data units. Usage charges would be 5¢ a data unit, charged for on local and regional bases from 9 data units a minute for local and 16 for regional service at 150 bps, up through 23 and 39 for 4800 bps service, 42 and 70 for 9600 bps, and 56 and 94 for 14,400 bps. There would be a $15 monthly charge in addition for a digital communications console at each location, and a $25 one-time installation charge would apply in all the service categories.

Planning to use Collins Radio Co., equipment, Datran applied for frequencies in the 6000 mHz range for the trunk routes and plans to use 11,000 mHz range for local facilities.

Trains can reach 300 mph from 3rd rail pickup

Trains, propelled by power from a third rail at wayside, can reach speeds up to 300 mph. Department of Transportation recently released two studies that support this high-speed feasibility; one by Westinghouse Electric Corp. and the other by General Electric Co. The Westinghouse study focuses on electric power systems, power distribution, power collection and power conditioning.

According to DOT, the high-speed electric current collection phase of the report concentrates on sliding contact/stiff rail techniques. Designs include:

—A multiple solid-shoe contact with a hydraulic control that keeps the contact pressed against the power rail.

—A wire brush shoe contact that uses a leaf spring to maintain pressure of the brushes on the power rail.

Through analysis of various methods of power distribution, a high-voltage (15 to 30 kv) alternating current system was found by Westinghouse to be technically and economically the most attractive with existing technology. High-voltage, direct-current power could possibly be better at the power levels and distances studied, but its use would require the development of new circuit breakers and high-voltage choppers to handle the current and voltage of such a system.

High-speed trains could be powered by either AC or DC conventional rotating motors or linear induction motors, states the report, with modern, solid-state thyristor controls to apply power. The DC power equipment would be lighter but bulkier than AC equipment, provided that developments of circuit breakers and choppers for voltage reduction can be solved.

The second study, conducted by GE, focuses on electric power collection and materials requirements. According to GE, the current collection phase of the report recommends a system based on the use of multiple contacts mounted on a servo-driven support. The high-speed trains could be powered by either AC or DC conventional rotating motors or linear induction motors.

For a power rail, both studies recommend a steel I-beam with aluminum bonded to its web to enhance conductivity.

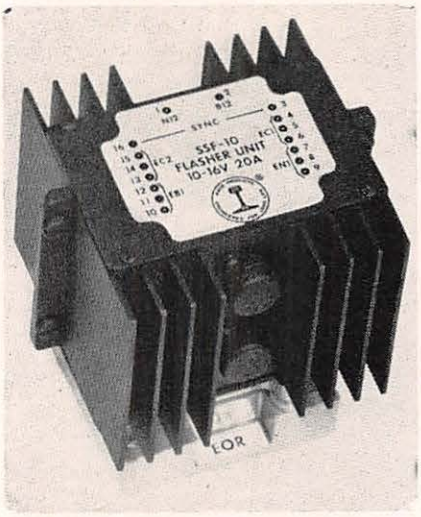
Chicago rep appointed for switch heaters

Modern Supply Co., 222 West Adams street, has been appointed manufacturer's representative in the Chicagoland area for the complete line of propane and natural gas railroad switch heaters manufactured by the White Mfg. Co., Indianapolis, Ind. **Robert E. Mann** directs Modern, and his associates are **Earle A. Mann** and **Louis Gruber.**

Graybar creates a new engineering department

To provide comprehensive technical support in connection with the marketing of NEC crossbar switching equipment, Graybar Electric Co., has created a new communications engineering department. **W. T. Kennedy, Jr.,** has been appointed manager and will be responsible for transmission and switching systems engineering and installation. **William A. Pitbladdo** has been appointed engineering consultant. Mr. Kennedy was manager communications engineering for Graybar and Mr. Pitbladdo was vice-president engineering, Rochester Telephone Co.

Product News



Solid-State flasher has silicon transistors (101)

A solid state flasher is available for use in all grade crossing flashing-light installations. The SSF-10 is completely solid state, and uses silicon transistors for maximum thermal stability and resistance to line surges. A "shorting" type circuit can be installed with present field and case wiring. The flasher operates consistent with relay operations as provided by standard AAR circuits. The SSF-10 has a high current capacity of 20 amp (10 amp each signal). This design permits tandem and synchronous operations where the current needs exceed 20 amp. A tip lamp on a gate installation does not require an additional conductor. The unit has no contacts to arc or burn, and there are no moving mechanical parts to show wear.

The SSF-10 is a compact unit that plugs-in. Socket screws hold the unit in place. Plug and socket are ruggedly built and accept #12 wire. Specifications are as follows: Voltage—8-16 volts DC (battery or half-wave rectified AC); Current—0-20 amp total; Temperature range—minus 40° to plus 160°F.; Flashing rate—adjustable 40 to 55 per minute; Size—3¼" x 4" x 3¾"; Weight—1½ lb. *Railroad Accessories Corp.*

Electro-dynamic retarder uses eddy currents (102)

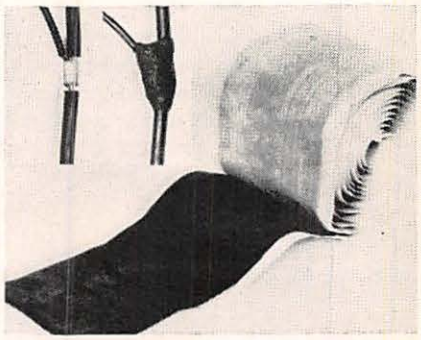
The electro-dynamic type retarder decelerates the coasting speed of the humped car and nullifies its excess kinetic energy by the eddy current effect. Outstanding features of the electro-dynamic retarder are its simplicity of design and non-existence of mechanically moving parts. A U-profile beam is arranged around the running rail and also takes up the excitation current bus. Arranged on the shanks of the U-section are the articulate, clasp type brake beams. While in operation, there occurs around the excitation current bus a concentrical build-up of the magnetic field which extends and permeates primarily through the U-section and the brake beams. With car wheel passing through the retarder, the brake beams close up to grip the side faces of the wheel, and there is obtained a closed iron circuit.

The moving car wheel intersects the lines of magnetic force, as a result of which there are generated: a) decelerating eddy currents in the car wheel, and b) a friction action between car wheel and brake beams. The eddy-current effect produces the essential decelerative force, cars are braked evenly and braking action is independent of wheel width. Brake beams and running rails are conveniently accessible, a fact which facilitates simple and speedy replacement.

Maximum usable length of electro-dynamic retarders is manufactured up to 15m. They are mounted on conventional type sleepers, and their installation requires no modification whatever of the permanent way. As articulate type brake beams of 1.5 to 2 meters length are used, retarder can also be installed in track curves from 190m radius on. Brake beams are of an inter-articulate design, rest on the continuous U-section of the retarder proper.

Height of grip—depending on specifications of railway concerned—lies between 60 and 120mm above top of rail. Conditional on height of grip of brake beams, maximum retentive force, acting on every wheel set, is from 1.5 to 2.2 Mp and decelerative action is exceptionally smooth and even. A noteworthy advantageous feature of the retarder is that soiled or oily wheel side surfaces decrease the retentive force only insignificantly.

The retarder can be installed and operated either as foot of hump retarder, or short of the classification tracks. It is laid out for direct current operation and fed out of a semi-conductor rectifier arrangement and functions with permeations of max. 50 kA each turn, whereby the retentive force is defined by the current intensity. Over an electronic control system, approaching car activates the retarder, and car speed is measured continuously. Retarder releases automatically, on car attaining a certain pre-defined exit speed. *Siemens America Inc.*



Sealing, insulating tape is pressure-sensitive (103)

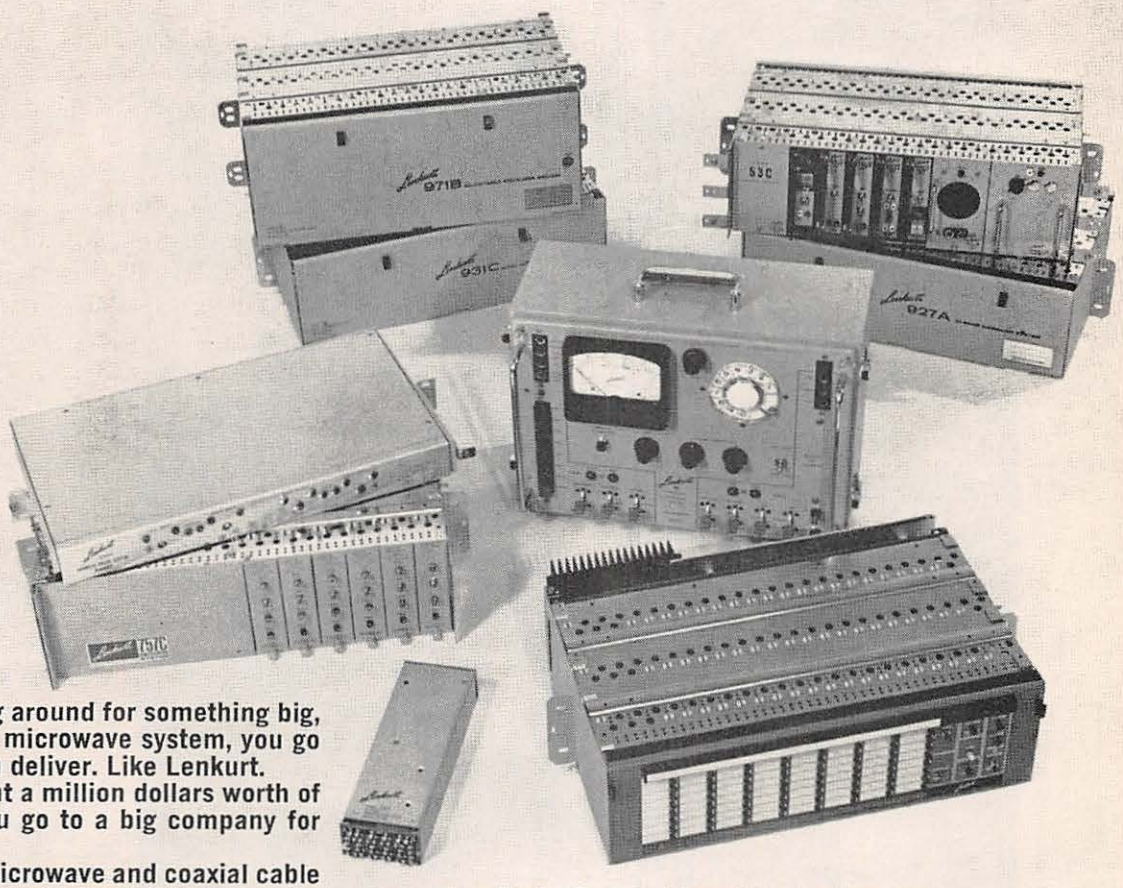
For sealing, insulating, and protecting, A-MP sealing and dielectric compound is a permanently pliable pressure-sensitive material that can be easily molded by hand to fit any configuration. Usable from −20° to +190°F, this black Butyl based mastic sealant is impervious to most environmental conditions and adheres readily to any clean dry surface including metal, porcelain, wood, glass and most plastics. Supplied in ⅛" thickness this compound is available in 10-ft rolls (with backing paper on one or both sides) 3¾" wide, or in boxes of 25 3¾" square pads. *American Pamcor Inc.*

Keyset has 12 buttons for digital data entry (104)

A twelve-button keyset that facilitates rapid manual entry of serial decimal or binary coded decimal data into electrical or electronic devices is type 1200. The touch calling buttons, "human engineered" to permit fast, accurate fingering, are numbered in the standard telephone configuration from one to zero. Two additional buttons (# and °) may be used to enter "start", "stop", or other special instructions. Operation of the type 1200 keyset is crisp, quick and positive. Each pushbutton closes two normally-open contacts in series with a common switch. By wiring the common switch in series with the pushbutton contacts so that switching is done by the common switch, the keyset has a

(Please turn to page 46)

These could be the end of something big.



When you're shopping around for something big, like a multi-million dollar microwave system, you go to a big company that can deliver. Like Lenkurt.

And any time you want a million dollars worth of cable carrier systems, you go to a big company for that, too. Like Lenkurt.

And when you want microwave and coaxial cable and multiplex and cable carrier and data transmission, you definitely go to Lenkurt. Because we're the only company that makes them all.

With all the big things we do, it isn't surprising that sometimes our small-ticket items, like accessories, get overshadowed.

So, just to let you know we have them: Any time you want some four-wire terminating sets, Lenkurt has them.

Or adjustable equalizers? Lenkurt again.

Or echo suppressors? Order wire? A microwave path protection system? A signaling system and a signaling test set? A status monitoring and alarm system? We have them all.

So when you come to us for the big things, don't forget Lenkurt makes the broadest line of the little things you need, too. Lenkurt Electric Co., Inc. San Carlos, California.

LENKURT ELECTRIC
Subsidiary of GENERAL TELEPHONE & ELECTRONICS

Transmission Accessories from Lenkurt

PRODUCT NEWS

(Continued from page 44)

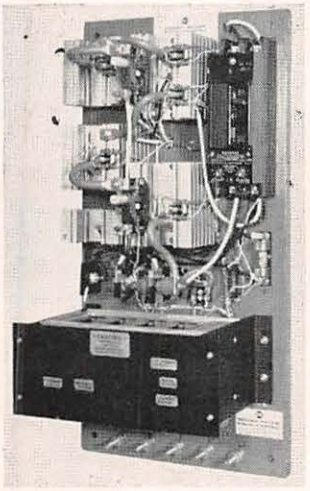
"make" and "break" capability of up to one ampere, N. I., 50 watts. Terminal design and arrangement provide for easy assembly into printed circuit boards. *Automatic Electric Co.*

Base radio stations can be remotely controlled (105)

Extension set for local and extended control of 2-way base radio stations, series 165 and 165-T, are described in bulletin SE-232. These units, which have a microphone, speaker, transmitter keying, and squelch control, can be operated at distances up to 300 ft. from the base radio stations. *Secode Electronics.*

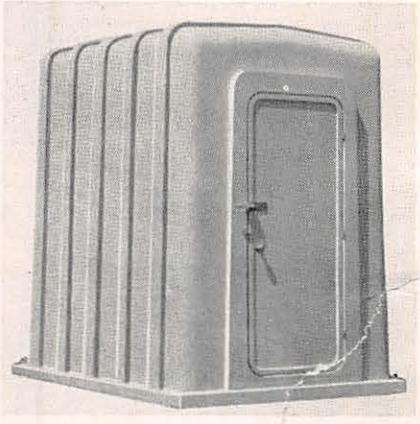
CRT terminal equipped with keyboard typing input (106)

CRT terminal is described in bulletin 682-12-68K. TEC series 500 Data-Screen terminals provide typewriter keyboard input and cathode ray tube output. A 12" rectangular CRT is used and, in some models, can provide 50 characters per line in 20 lines display. The series 500 terminals can connect directly to Data-Phone modems. Transmission is synchronous at data rates up to 4800 bits per second. Interface for direct computer coupling consists of USASCII coded character lines for high speed data transfer in a half duplex mode at rates in excess of 38K characters per second. *Transistor Electronics Corp.*



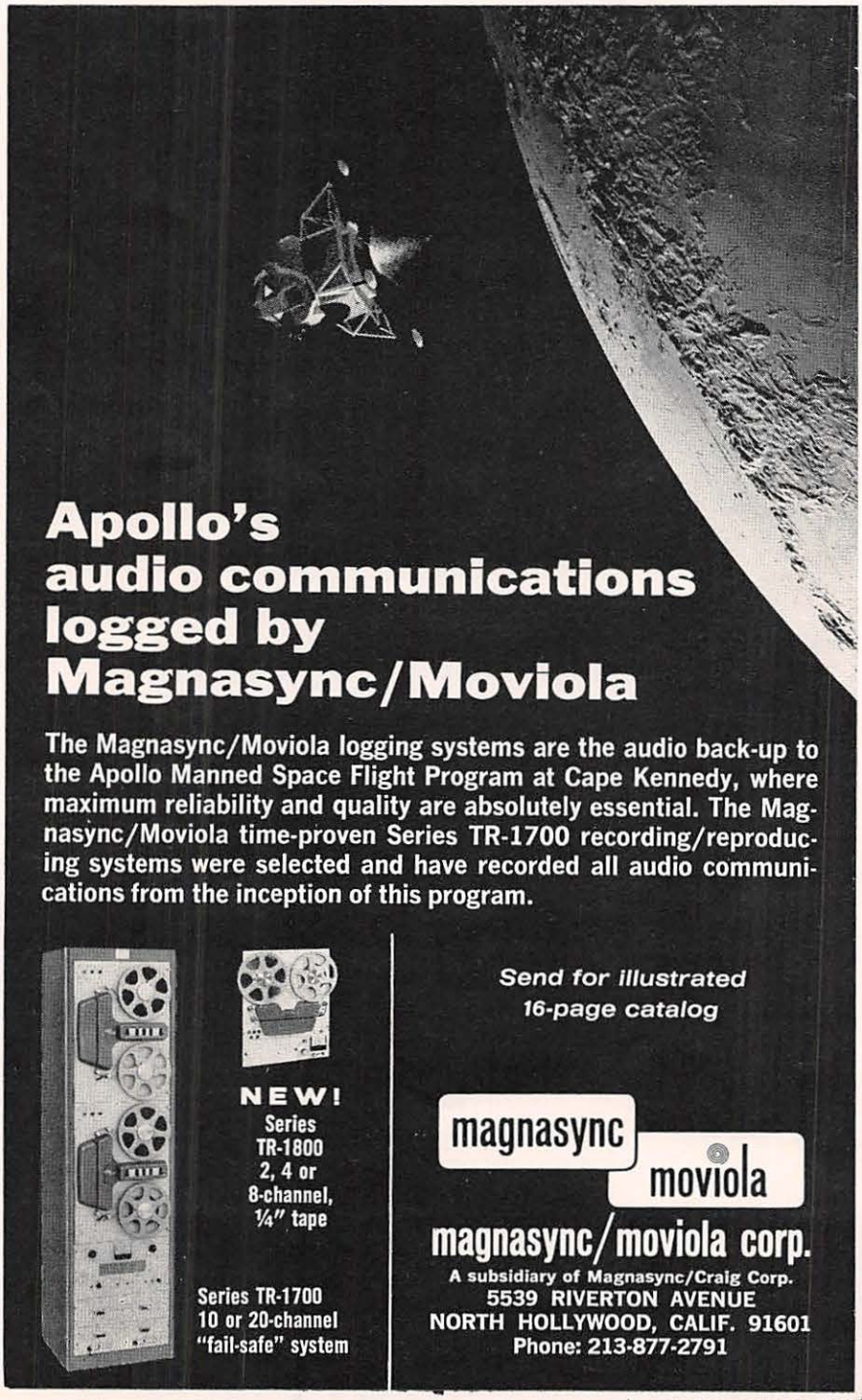
Retarder contactor panels have solid-state unit (107)

A solid-state replacement is available for contactor panels used with type E line of series motor brake electric retarders. The new panel fits directly into the position of the old one, and uses the same wiring connections; changeover takes only minutes. Silicon controlled rectifiers are used instead of electromechanical contactors. The solid-state panel includes a lockout circuit to prevent application of reverse current until the motor armature stops. *General Railway Signal Co.*



Equipment shelter has walls and roof of fiberglass (108)

A new equipment shelter has walls and roof of molded fiberglass interior and exterior with a polyurethane core to form a one piece sandwich panel.


Apollo's audio communications logged by Magnasync/Moviola
The Magnasync/Moviola logging systems are the audio back-up to the Apollo Manned Space Flight Program at Cape Kennedy, where maximum reliability and quality are absolutely essential. The Magnasync/Moviola time-proven Series TR-1700 recording/reproducing systems were selected and have recorded all audio communications from the inception of this program.
NEW! Series TR-1800 2, 4 or 8-channel, ¼" tape
Series TR-1700 10 or 20-channel "fail-safe" system
Send for illustrated 16-page catalog
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A subsidiary of Magnasync/Craig Corp.
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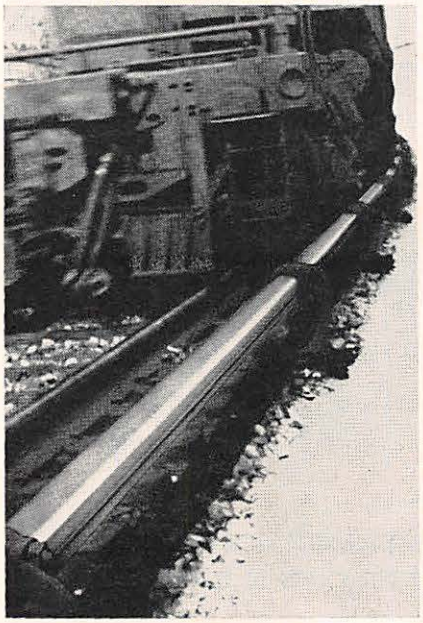
NORTH HOLLYWOOD, CALIF. 91601
Phone: 213-877-2791
Circle 17 on reader service card

A hatch-type door opening permits a continuous, positive seal. Moisture and vermin proof, self extinguishing materials, boat-hull type finish for maintenance free attractive appearance, lightness in weight, with exceptional rigidity for ease of handling and a "U" factor of 0.085 are some of its features. The shelter is offered in a number of popular sizes and designs with choice of color. *Grasis Fabricating Co.*



Third rail cover is made of rigid vinyl (109)

A bright orange, snap-on shield of tough, weather-resistant, rigid vinyl is now used successfully by Penn Central to replace the three-piece wooden covers previously installed to guard 600 volt DC third rails. Penn Central reports that the new 9 ft, 6.5 lb sections of the shield require less than a minute for installation by only one man as compared to two men working 20 minutes with the old wooden guards that were time consuming to install, and constituted a definite fire hazard. The vinyl will not support combustion. *Stokes Molded Products.*

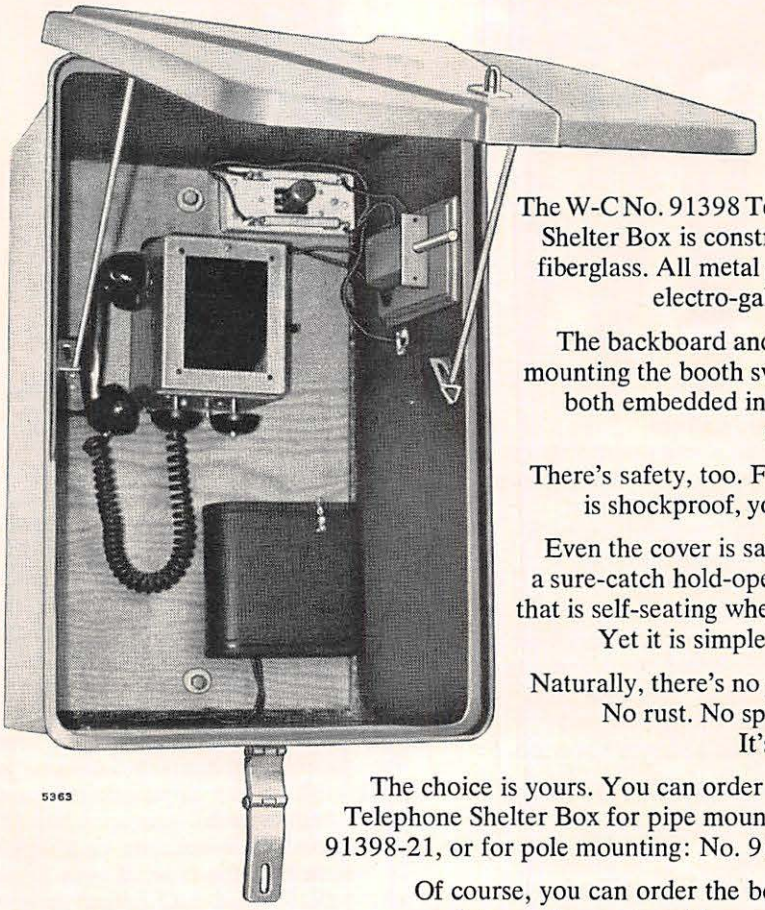
Road-rail units can have track circuit shunting (110)

A new solid-state shunt system for use on vehicles equipped with railroad conversion units is available. During rail operations, four spring-loaded shunting brushes slide atop the rail to actuate track circuits and highway crossing signals. Brush wear is adjusted and brush "blocks" are easily replaced when needed.

(Please turn to page 48)

Want a Telephone Shelter Box That'll Look New in the Year 2001?

Western-Cullen's Got It Now!



5363

The W-C No. 91398 Telephone Shelter Box is constructed of fiberglass. All metal parts are electro-galvanized.

The backboard and pad for mounting the booth switch are both embedded in the base material.

There's safety, too. Fiberglass is shockproof, you know.

Even the cover is safe. It has a sure-catch hold-open device that is self-seating when raised. Yet it is simple to close.

Naturally, there's no painting. No rust. No splintering. It's ageless.

The choice is yours. You can order the W-C Telephone Shelter Box for pipe mounting: No. 91398-21, or for pole mounting: No. 91398-22.

Of course, you can order the box alone; complete as shown, or with any of those components.

MEMBER RPI RAILWAY PROGRESS INSTITUTE

For further information see your W-C Catalog, Section 43.

WESTERN-CULLEN DIVISION
FEDERAL SIGN AND SIGNAL CORPORATION
2700 West 36th Place · Chicago, Illinois 60632
Canada: Woodings Canada, Ltd., 5 Place Ville Marie, Montreal 2, Que.
Circle 18 on reader service card

Now is the time to sell your obsolete line wire!

When plans call for switching to a low maintenance system, a big part of the problem is up in the air. Diversified Dismantling Corporation, with its miles of experience in removing and salvaging transmission wire, poles and support towers over every type of terrain and through congested neighborhoods, can take care of the problem for you and increase your salvage revenue.

Write, wire or call collect:

Diversified Dismantling Corporation
Subsidiary of Diversified Metals Corporation
123 Byassee Drive
Hazelwood, Missouri 63042
Telephone 314 731-3060

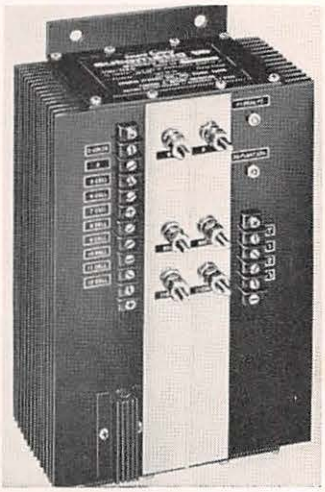
Western D.M.C.
Cucamonga, California
Eastern D.M.C.
Tamaqua, Pennsylvania
Liberty Smelting Works Ltd.,
Montreal, Quebec, Canada

Circle 19 on reader service card

PRODUCT NEWS

(Continued from page 47)

A unique monitor system instantly indicates by means of an available "beep beep" signal and/or dashboard red light whenever the track circuit voltage is not being properly shunted. An attractive dash-mounted indicator box features "off-on" switch for cancelling shunting where not desired. Full solid-state circuitry should require minimum maintenance. *W. T. Cox Company*



Battery chargers have trickle, float and 2-rate control (111)

A new line of chargers, consisting of three models, is completely solid state and is designed to combine the best features of trickle, float and 2-rate charge control, in order to maintain precise charge control over the battery and to restore capacity to the battery in the shortest possible time. After initial installation, the charger operation is completely automatic. Any one of the chargers can be used for nickel-cadmium, nickel-iron or lead acid battery applications. Accurate temperature compensation is maintained by a separate unit which is matched to the type of cells being charged. Filtered DC output is provided to within ±1% ripple; and AC input can vary by ±10% without affecting the battery circuit.

The three models available are TCB-2, TCB-4 and TCB-6. The TCB-2, rated at 2 amp and the TCB-6, rated at 6 amp are for charging 5 to 12 cells of nickel-cadmium or nickel-iron and 5 to 8 cells of lead acid. The TCB-4, rated at 4 amp is for charging 1 or 2 cells of nickel-cadmium, nickel-iron or lead acid. All models have the same overall dimensions; 7½" wide, 5¾" deep and 13" high (including mounting brackets). *Thomas A. Edison Industries, Primary Battery Div.*

Document reader sends data from cards or forms (112)

A new document reader transmits either 8 or 12 parallel data bits to data recording equipment. The MDR-8000, a mark-sense document reader can read cards or page-size forms of varying sizes and shapes which are marked with an ordinary lead pencil, besides reading punched data. The MDR-8000 can transmit information in parallel, in hard-wired applications. Documents can be read directly to magnetic or paper tape for subsequent entry into a computer at high speed. MDR-8000 reads the Hollerith input code. The 8-bit output code can be selected by the user from among USASCII alphanumeric, PTTC/BCD, and EBCDIC; the 12-bit output code is Hollerith. Scan rates can be optionally selected: 10, 70, or 140 characters/sec. Material can be fed into the reader by hand or, optionally, from an automatic 250-tab card hopper. The automatic hopper is equipped with audible and visual empty-condition alarms. *Motorola Instrumentation & Control Inc.*

RADIO-COMMUNICATIONS TECHNICIAN—Alexandria, Va. area. Applicant must be high school graduate with at least a second-class FCC Radio License. Salary based on education and previous experience. Liberal fringe benefits. Railroad will pay relocation expenses. Contact **Mr. T. B. Choate, Director of Personnel, Richmond, Fredericksburg and Potomac Railroad Co., Room 209 Broad Street Station, Richmond, Virginia 23220. An equal opportunity employer.**

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Hand-thrown or remote-controlled

Hayes ALL-STEEL DERAILS

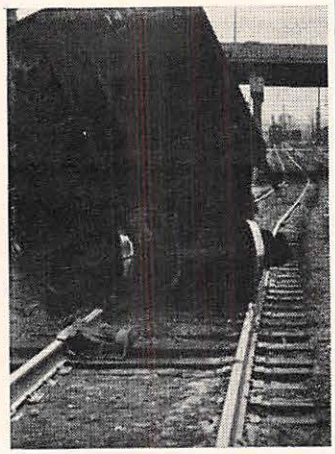
physically protect the main line

Derails or signals? Each has its place: signals are obeyed by men; Hayes Derails are obeyed by equipment.

When signals are not involved, the Hayes Derail alone is competent to keep the main track clear.

In modern signal systems, the Hayes Sliding Derail with DeLectric® Operator under remote control provides complete protection.

The "calculated risk" of omitting derails may be costly. Hayes Derail protection is inexpensive.



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Free leatherette ring-binder catalog of world's most-specified derails, bumping posts and wheel stops (including periodic supplement sheets). Write on letterhead.

Track safety devices that WORK at the job.

Hayes Track Appliance Co.

RICHMOND, INDIANA 47374

Circle 20 on reader service card

Is there a Teleprinter Serviceman in the House?

You can get one—quick. Just dial (609) 963-8000. At extension PH-311, you'll get all the facts about RCA service: contractual, per call, or emergency. Coast-to-coast service is offered by RCA for the account of the manufacturer and large user. Check on it. Phone today, or if you prefer, write RCA Service Company, A Division of RCA, Bldg. CHIC-225, Camden, N. J. 08101.

RCA

Editor's Corner

A new look

For this magazine and its oldest advertiser, the Kerite Co., the January 1970 issue marks the end of one era—and the beginning of another.

For 60 years the Kerite Co.'s ad occupied the front cover of *Railway Signaling and Communications* and its predecessor, the *Signal Engineer*. This is very likely a record in business publishing.

The first front-cover Kerite ad appeared in May 1909 (see cut). The 728th Kerite ad appeared on the December 1969 front cover.

But times change . . . the needs of readers and advertisers change. Some months ago we decided to redesign RSC, inside and out, in the hope that we could do an even more effective job for the industry we serve.

Throughout this period of change, we had the friendly and helpful cooperation of the people at Kerite. Our thanks go to William A. Edwards, Kerite's vice president and general sales manager, and to Kerite's retired president, Arthur H. Smith, whose many contributions to railroading have included the chairmanship of the Railway Progress Institute, and who, more recently, served the industry as executive director and secretary-treasurer of the Railway Signal & Communications Suppliers Association.

As a result of all this, we have our first editorial front cover this month. You will find Kerite's ad in the center spread in this issue—and, we hope, in at least 728 more issues to come.

Robert G. Lewis, Publisher

A new decade

During the decade ahead signal, communications and system control engineers—because of the rapid advances in technology—will be hard pressed to keep pace or even a little ahead to meet the impact of technology on their fields of endeavor.

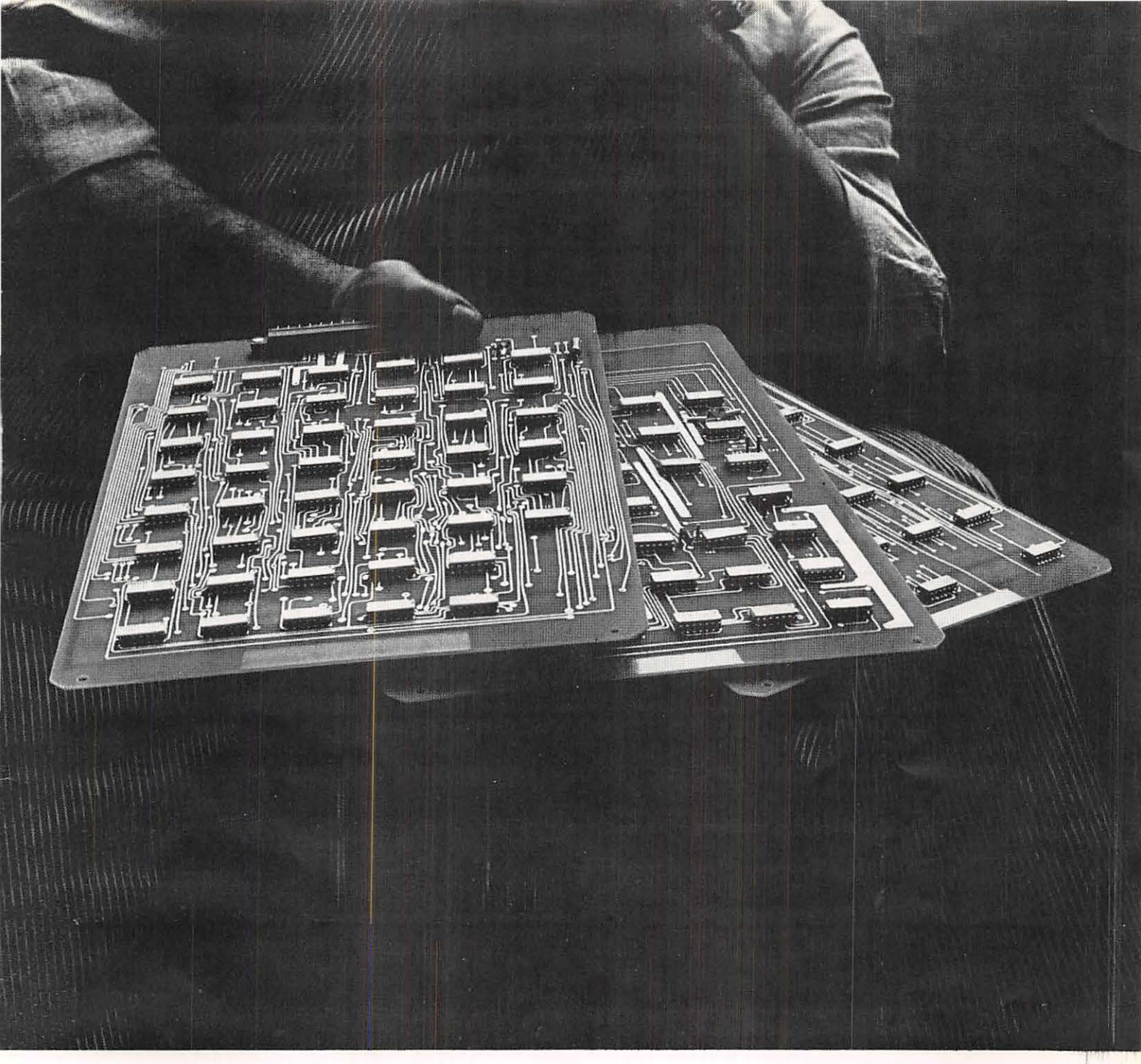
Funds will be available for equipment and plant that provide immediate and good returns on the investment. But there will be a continuing need for evaluation to justify the expenditures. Fortunately, the systems approach using analytical techniques and the computer can provide cost-benefit analyses.

The trend toward centralized control will continue, because of real-time computing (greater capacity through higher speeds and multiprocessing levels) and high-speed, high capacity communications links.

There will be more refinements in programming to produce fewer but more useful reports for management.

Special usage computers or process controllers will be used for such tasks as operating centralized traffic control systems, analyzing hotbox detector outputs to improve inspection practices, and handling automatic car identification scanner readouts for terminal and operations control, to name a few. Also, there will be increased use of small or medium sized digital computers for terminal control. Many of these processors will be connected by high-speed data links to the railroad's central computer complex for direct computer-to-computer handling of data.

In short, the decade ahead will find the system control engineer confronted with problems of ever increasing complexity, sophistication and size. However, advancing technology will give him the tools to solve these problems.



Pick a system. Any system.

You pick the system you need with the new KarTrak* ACI by Sylvania. And you can change the system simply by changing circuit cards.

Sylvania's new building block approach gives you the options you want, when you want them.

Start with a basic KarTrak ACI unit. Modify it as your needs require. Add a digital clock, carrier index, data storage, piggyback formatting and other options as you need it. When you need it. And the change is made in a matter of minutes.

Interfacing circuit boards tie your new KarTrak ACI scanner into your present communications system or any system you plan for the future. All with the change of a circuit card.

And Sylvania's new KarTrak ACI also solves your maintenance problems—practically eliminates down time. It's done with rugged, reliable integrated circuits.

When a breakdown does occur, it can be traced and repaired in minutes thanks to Sylvania's new semi-automatic test set. It pins down 90 percent of failures to a card or drawer. Gets the system back on line fast.

For the flexibility you need in ACI systems, talk to the pioneers about the 800 series third generation system.

Sylvania Information Systems, Commercial Electronics Division, Bedford, Massachusetts 01730.

*Trademark

Circle 2 on reader service card

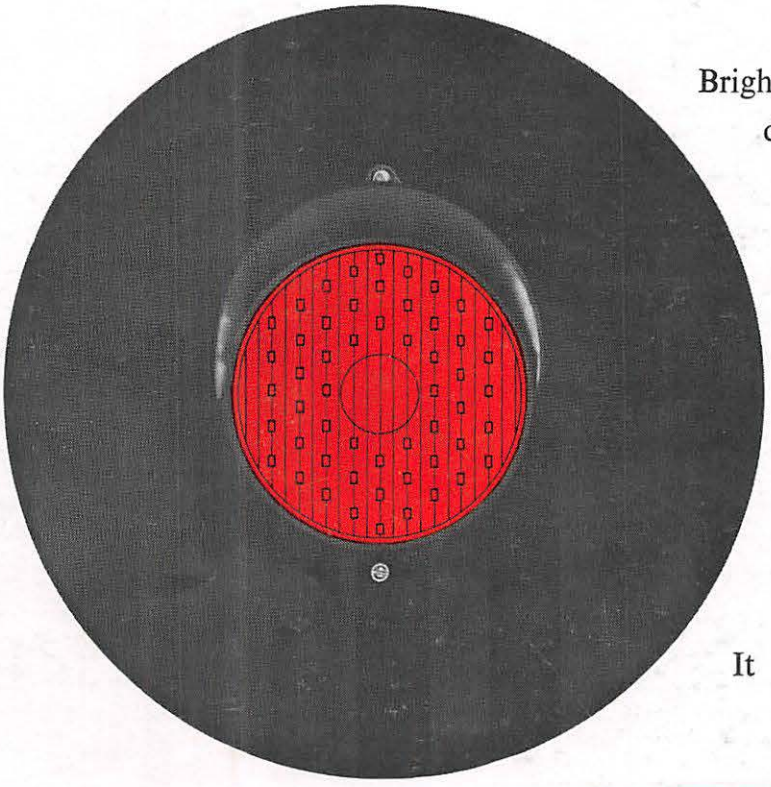
Leaders in ACI Systems

SYLVANIA
A SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS

INDEPENDENT TEST PROVES

WESTERN-CULLEN'S NEW HOT-SPOT ROUNDEL GIVES 47% IMPROVED INDICATION OVER OTHER MAKE

(With a peak candlepower of 4750 at 1500 feet.)



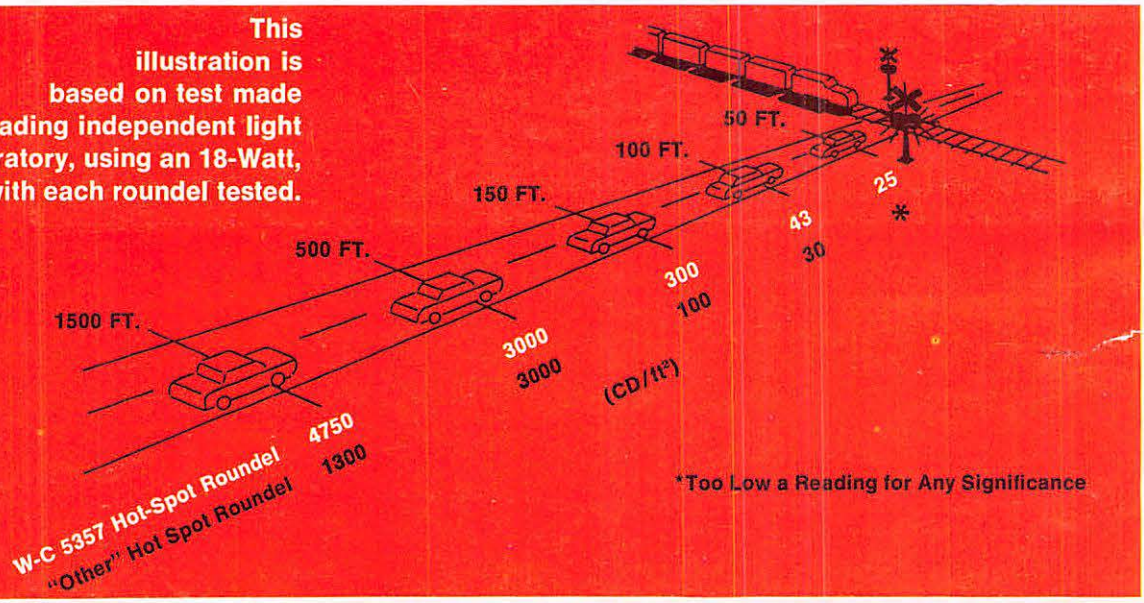
Brighter signal light indication at most every distance . . . that's the primary benefit of Western-Cullen's new Hot-Spot Roundel No. 5357.

It was purposely designed to assure consistent overall brightness, from a distance of 25 feet to over 1500 feet from the flashing light.

The No. 5357 Hot-Spot Roundel has a 10° vertical spread. Its horizontal spread is 20° in one direction, which is reversible.

It is of high-impact plastic, 8⅜″ dia., available in red.

This illustration is based on test made by a leading independent light testing laboratory, using an 18-Watt, 10-Volt bulb with each roundel tested.



Want further illumination? Send for a set of Iso-candle diagrams which give the facts . . . .

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Circle 3 on reader service card